# MINERALS YEARBOOK

## 1964

Volume II of Four Volumes

## MINERAL FUELS

*Prepared by staff of the*
**BUREAU OF MINES**

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**UNITED STATES DEPARTMENT OF THE INTERIOR • Stewart L. Udall, Secretary**

**BUREAU OF MINES • Frank C. Memmott, Acting Director**

Created in 1849, the Department of the Interior—a Department of Conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

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*Chief, Division of Petroleum*



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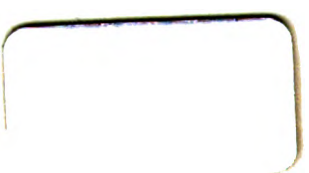

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# Review of the Mineral-Fuel Industries

By Warren E. Morrison [1] and Edward E. Johnson [1]

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Stimulated by 4 years of continuous economic growth without inflation, demand for energy in the United States reached an alltime high in 1964. Total value of production of goods and services (gross national product—GNP) for the year was $629 billion, an increase of 6.8 percent from 1963. Allowing for price changes based on 1958 dollars, the gain in real terms was 5 percent. In 1964 the Federal Reserve Board Index of Industrial Production stood at 132, a rise of 6.2 percent. With the impetus provided by personal income and corporate tax reductions during the year, aggregate wages, profits, and consumption reached record levels. Even the persistent balance of payments problem improved.

Against this background the national consumption of commercial energy increased 4.2 percent. Energy needs continued to be met largely from domestic resources with imports, mainly crude petroleum and refined petroleum products, accounting for but 7 percent of the total. Mineral energy resources, namely gas, coal, and petroleum, contributed 96 percent of the input of energy into the economy during the year. The remaining 4 percent came from hydropower and nuclear power.

Output of all major energy resources increased, except the dwindling anthracite component of coal. Bituminous and lignite production rose to 487 million tons; natural gas output, to 15,546 billion cubic feet; and crude petroleum, to 2,805 million barrels. Hydropower output was 180,033 million kilowatt hours, and nuclear power was 3,341 million kilowatt hours. Crude petroleum and natural gas together contributed two-thirds of the total domestic production of energy resources. Coal followed with one-quarter of the total. For the second year the calorific content of natural gas output exceeded that of crude petroleum.

Demand for energy increased in all of the major energy markets (consuming sectors) in 1964. In the household and commercial sector natural gas, used mainly for space heating, superseded petroleum as

[1] Economists, Division of Economic Analysis.



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the ranking energy source. Utilization of petroleum products in this sector actually declined during the year along with coal, and only gas showed a net gain. Natural gas, used mainly for process heat, was also the predominant source of energy in industry. Coal and petroleum followed in that order. Gains in industrial demand for petroleum products were most notable in raw materials uses, particularly the growing offtake of liquefied petroleum gases for the petrochemicals industry. The largest increase in industry demand, however, was for coking coal to meet the coke needs of the booming iron and steel industry. Demand for coal also increased significantly in the electric utility market with utilities absorbing almost half of the total production of bituminous coal. Inputs of natural gas and petroleum at utility plants also increased. As for transportation, direct fuels, mainly petroleum products, continued to dominate demand. Among the major petroleum products, gasoline accounted for three-quarters of total petroleum utilized in transportation and registered the largest gain. In addition to direct consumption of energy resources within the various energy markets during the year, an estimated 55 percent of the electric power generated by utility plants was distributed for household and commercial use. Most of the remainder went to industry. In these energy markets utility electricity is a growing competitor with direct consumption of mineral energy resources.

Accompanying the expansion in production of mineral energy resources were significant gains in the dollar value of primary and secondary products. With no inflation, prices and costs in the mineral industries remained relatively stable, nor were there any significant shifts in employment and wages. National income generated by the energy resource industries increased but at a slower rate than total income generated by all industries. With the continuing expansion of the economy were increases in expenditures for new plants and equipment in the mining sector, and in the petroleum and coal segments of the manufacturing sector. No significant changes occurred in the levels of United States foreign trade in energy resources, either in imports or exports.

Several new tables are included in this chapter. Shown for the first time in tables 9 through 13 are individual supply and demand balances for the major mineral energy resources that contribute to the energy balances in table 7. Several tables formerly featured in the international section of this review chapter have been transferred to Volume IV Area Reports—International. These include the index of world production of coal, crude petroleum, and natural gas; production of electricity and mineral fuels in selected Organization for Ecomonic Cooperation and Development (OECD) countries; and world-trade price indexes.

## PRODUCTION

**Production by Source.**—Total production of mineral energy resources and electricity from hydropower and nuclear power (table 1) was equivalent to 48.1 quadrillion British thermal units (Btu) in 1964. Continuing its rising trend, natural gas output increased to 36 percent of total energy resources production. Crude petroleum with a somewhat lower growth rate than gas accounted for 33 percent of the

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total, while the coal portion was 27 percent. The contribution of hydropower was less than 4 percent, and nuclear power was less than 1 percent. Figures 1 and 2 show the trend of production of major

**TABLE 1.—Production of mineral energy resources and electricity from hydropower and nuclear power, in British thermal units (Btu), and percentage contributed by each in the United States [1]**

| Year | Trillion Btu [1] | | | | | | |
|---|---|---|---|---|---|---|---|
| | Bituminous coal and lignite | Anthracite | Crude petroleum | Natural gas, wet (unprocessed) | Electricity | | Total |
| | | | | | Hydropower | Nuclear power | |
| 1960 | 10,886 | 478 | 14,935 | 13,822 | 1,578 | 5 | 41,704 |
| 1961 | 10,558 | 443 | 15,155 | 14,691 | 1,605 | 17 | 42,469 |
| 1962 | 11,060 | 429 | 15,405 | 15,255 | 1,774 | 23 | 44,146 |
| 1963 | 12,024 | 464 | 15,741 | 16,271 | 1,741 | 33 | 46,274 |
| 1964 | 12,759 | 436 | 15,925 | 17,128 | 1,853 | 34 | 48,145 |
| | Percentage | | | | | | |
| 1960 | 26.1 | 1.1 | 35.8 | 33.2 | 3.8 | ---------- | 100.0 |
| 1961 | 24.8 | 1.0 | 35.8 | 34.7 | 3.7 | ---------- | 100.0 |
| 1962 | 25.0 | 1.0 | 35.1 | 34.8 | 4.0 | .1 | 100.0 |
| 1963 | 26.0 | 1.0 | 34.0 | 35.1 | 3.8 | .1 | 100.0 |
| 1964 | 26.5 | .9 | 33.1 | 35.6 | 3.8 | .1 | 100.0 |

[1] Hydropower and nuclear power include installations owned by manufacturing plants and mines, as well as Government and privately owned public utilities. The fuel equivalent of hydropower and nuclear power is calculated from the kilowatt-hours of power produced, converted to coal input equivalent at the prevailing average pounds of coal per kilowatt-hour each year at central electric plants, using 12,000 Btu per pound.

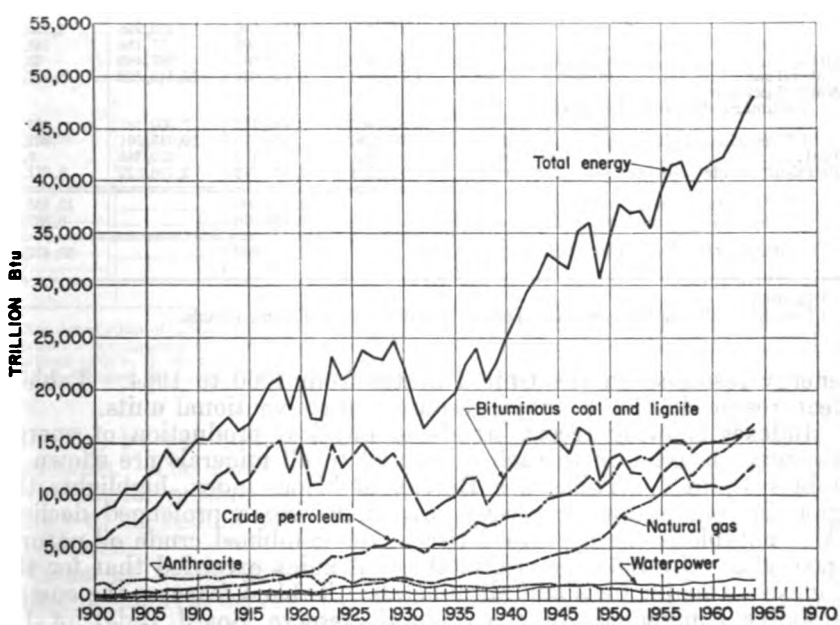


FIGURE 1.—Production of mineral energy resources and energy from hydropower in continental United States, 1900 to 1964.

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**TABLE 2.—Mineral energy resources production in the United States**

| Mineral | 1961 | | 1962 | |
|---|---|---|---|---|
| | Quantity | Value (thousands) | Quantity | Value (thousands) |
| Asphalt and related bitumens, native: | | | | |
| Bituminous limestone and sandstone short tons | 1,558,792 | $12,818 | 1,647,063 | $14,601 |
| Gilsonite do | | | | |
| Carbon dioxide, natural, estimated thousand cubic feet | 545,354 | 82 | 1,144,107 | 146 |
| Coal: | | | | |
| Bituminous and lignite [1] thousand short tons | 402,977 | 1,844,563 | 422,149 | 1,891,553 |
| Pennsylvania anthracite do | 17,446 | 140,338 | 16,894 | 134,094 |
| Helium thousand cubic feet | 551,785 | 10,263 | 599,519 | 20,905 |
| Natural gas million cubic feet | 13,254,025 | 1,996,241 | 13,876,622 | 2,145,301 |
| Natural gas liquids: | | | | |
| Natural gasoline and cycle products thousand gallons | 6,105,463 | 412,019 | 6,244,522 | 444,817 |
| LP gases do | 9,085,465 | 370,186 | 9,409,083 | 353,334 |
| Peat short tons | 531,067 | 5,036 | 566,441 | 5,186 |
| Petroleum, crude thousand 42-gallon barrels | 2,621,758 | 7,565,582 | 2,676,189 | 7,774,051 |
| Total mineral energy resources | | 12,357,000 | | 12,784,000 |
| Total all other minerals | | 5,873,000 | | 6,054,000 |
| Grand total, mineral production | | 18,230,000 | | 18,838,000 |

| Mineral | 1963 | | 1964 | |
|---|---|---|---|---|
| | Quantity | Value (thousands) | Quantity | Value (thousands) |
| Asphalt and related bitumens, native: | | | | |
| Bituminous limestone and sandstone short tons | r 1,632,645 | r $8,383 | 1,935,344 | $10,038 |
| Gilsonite do | | | | |
| Carbon dioxide, natural, estimated thousand cubic feet | 1,295,545 | 178 | 1,236,816 | 166 |
| Coal: | | | | |
| Bituminous and lignite [1] thousand short tons | 458,928 | 2,013,309 | 486,998 | 2,165,582 |
| Pennsylvania anthracite do | 18,267 | 153,503 | 17,184 | 148,648 |
| Helium thousand cubic feet | 627,344 | 21,957 | 667,440 | 23,360 |
| Natural gas million cubic feet | 14,746,663 | 2,328,030 | 15,546,592 | 2,387,689 |
| Natural gas liquids: | | | | |
| Natural gasoline and cycle products thousand gallons | 6,534,967 | 439,173 | 7,000,181 | 463,600 |
| LP gases do | 10,302,250 | 359,770 | 10,743,591 | 362,792 |
| Peat short tons | 546,621 | 5,423 | 639,365 | 6,181 |
| Petroleum, crude thousand 42-gallon barrels | 2,752,723 | r 7,965,743 | 2,786,822 | 8,017,078 |
| Total mineral energy resources | | r 13,295,000 | | 13,585,000 |
| Total all other minerals | | 6,320,000 | | 6,887,000 |
| Grand total, mineral production | | r 19,615,000 | | 20,472,000 |

r Revised.
[1] Includes small quantity of anthracite mined in States other than Pennsylvania.

energy resources in the United States from 1900 to 1964. Table 2 features production of major resources in conventional units.

Indexes showing recent trends of physical production of energy resources in relation to each other and to all minerals are shown in tables 3 and 4. Table 3, a Bureau of Mines index, highlights the gain in coal output in recent years following a prolonged decline. Also notable is the continued rise in the combined crude oil-natural gas index. In 1964 the rise in the coal index exceeded that for the indexes of major fuels and all minerals. Table 4 features the energy resource components of the Federal Reserve Board Index of Industrial Production. The separate index shown for gas and gas liquids highlights the significant gains made by gas, and more par-

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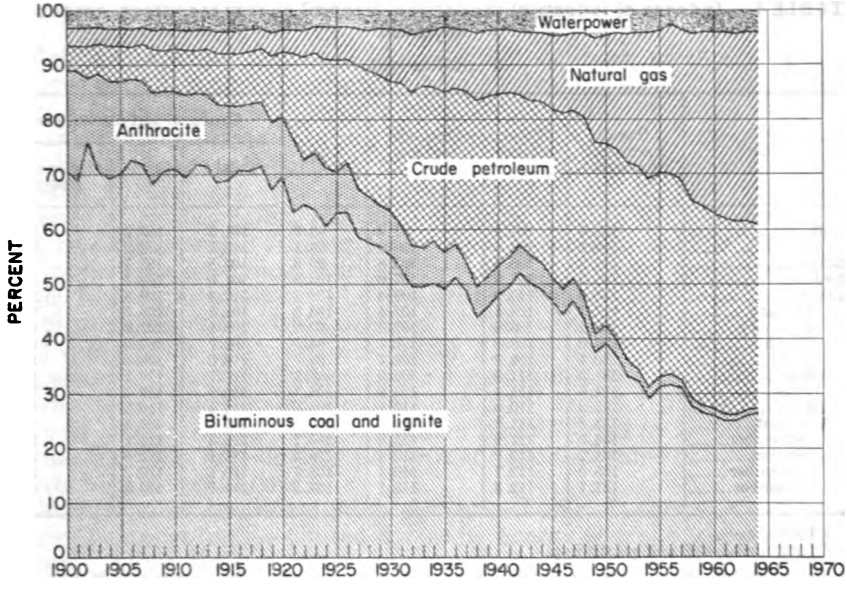


FIGURE 2.—Percentage of total production of British thermal units equivalent of mineral energy resources and energy from hydropower in continental United States, 1900 to 1964.

**TABLE 3.—Indexes of physical volume of mineral production in the United States by groups and subgroups [1]**

(1957-59=100)

| Year | All minerals | Energy resources | | | Metals | Nonmetals |
|---|---|---|---|---|---|---|
| | | Total | Coal | Crude oil and natural gas [2] | | |
| 1960 | 102.1 | 100.3 | 94.0 | 102.3 | 107.5 | 108.0 |
| 1961 | 102.9 | 101.2 | 90.8 | 104.6 | 103.3 | 110.3 |
| 1962 | 106.0 | 104.0 | 94.7 | 107.0 | 106.2 | 115.4 |
| 1963 | 110.8 | 108.8 | 102.9 | 110.7 | 107.6 | 121.7 |
| 1964 | 114.8 | 111.6 | 107.4 | 112.9 | 115.6 | 126.1 |

[1] For description of index see Minerals Yearbook 1956, V. 1, Review of the Mineral Industries, pp. 2-5. Indexes for components of the fuels index go back to 1880 (initial year of the overall index) in Minerals Yearbook 1966, v. II, pp. 9-10.
[2] Does not cover isopentane, LP-gases, and other natural gas liquids.

ticularly, by gas liquids which are in increasing demand for petrochemicals. The slower rate of growth shown for mining, relative to industrial production, indicates the tendency of the mining industry to lag behind industrial production during periods of economic expansion.

**Value of Production.**—The dollar value of mineral production including mineral energy resources is shown in table 5. Total value of primary energy resources exceeded the combined values of metals and nonmetals and was about two-thirds of the value of all mineral production. Separate values for the major energy resources are

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**TABLE 4.—Indexes of industrial production, mineral energy resources, seasonally adjusted**

(1957–59=100)

| Year | Total industrial production | Total mining | Coal, oil, and gas | Coal | Crude oil and natural gas | | |
|---|---|---|---|---|---|---|---|
| | | | | | Total [1] | Crude oil | Gas and gas liquids |
| 1960 | 108.6 | 101.6 | 97.9 | 93.7 | 101.0 | 100.9 | 113.2 |
| 1961 | 109.8 | 102.6 | 100.9 | 90.1 | 103.1 | 103.0 | 116.8 |
| 1962 | 118.3 | 105.0 | 103.8 | 95.3 | 108.5 | 105.1 | 120.4 |
| 1963 | 124.3 | 107.9 | 107.0 | 102.5 | 107.9 | 108.1 | 128.7 |
| 1964 [p] | 132.0 | 110.9 | 109.4 | 104.3 | 110.4 | 109.8 | 136.5 |
| January | 127.7 | 108.8 | 107.5 | 104.0 | 108.3 | 108.5 | 132.2 |
| February | 128.2 | 108.9 | 107.4 | 99.2 | 109.1 | 107.8 | 136.2 |
| March | 129.0 | 108.8 | 107.1 | 94.5 | 109.7 | 109.0 | 133.3 |
| April | 130.5 | 109.9 | 108.1 | 98.7 | 110.0 | 109.6 | 134.8 |
| May | 131.3 | 111.3 | 109.9 | 106.1 | 110.7 | 110.1 | 135.3 |
| June | 131.6 | 111.4 | 109.8 | 105.1 | 110.8 | 110.2 | 137.1 |
| July | 132.9 | 110.9 | 110.1 | 105.0 | 111.1 | 110.3 | 139.0 |
| August | 133.8 | 111.9 | 110.7 | 107.9 | 111.3 | 109.8 | 139.6 |
| September | 134.0 | 111.9 | 111.0 | 105.1 | 112.3 | 111.1 | 139.1 |
| October | 131.2 | 112.0 | 110.8 | 109.2 | 111.1 | 110.8 | 136.8 |
| November | 135.0 | 112.7 | 110.1 | 108.7 | 110.4 | 110.2 | 136.5 |
| December | 137.7 | 112.3 | 110.1 | 107.2 | 110.7 | 110.9 | 133.8 |

[p] Preliminary.
[1] Total includes oil and gas drilling.

Source: Board of Governors of Federal Reserve System. Industrial Production 1957–59 Base, and Statistical Releases for Feb.–June, 1965.

shown in table 2 along with physical quantities produced. It is interesting to note that while the calorific content of natural gas produced during the year exceeded that of crude petroleum (table 1), the dollar value of crude petroleum produced in 1964 was more than half of the value of total mineral energy resources production and almost 3½ times the value of natural gas output (table 2). The value of natural gas output during the year was 18 percent of the energy resources total while coal, mainly bituminous, was 16 percent. Natural gas liquids and helium (table 2) are byproducts of the primary production of natural gas. To determine the value of primary mineral energy resources production, the value of secondary products should be deducted.

**TABLE 5.—Value of mineral production in the United States, by mineral group [1]**

(Millions)

| Mineral groups [2] | 1960 | 1961 | 1962 | 1963 | 1964 | Change in 1964 from 1963 (percent) |
|---|---|---|---|---|---|---|
| Metals and nonmetals, except fuels: | | | | | | |
| Nonmetals | $3,868 | $3,946 | $4,117 | $4,318 | $4,662 | 7.9 |
| Metals | 2,022 | 1,927 | 1,937 | r 2,002 | 2,265 | 13.1 |
| Total | 5,890 | 5,873 | 6,054 | 6,320 | 6,887 | 9.0 |
| Mineral energy resources | 12,142 | 12,357 | 12,784 | r 13,295 | 13,585 | 2.2 |
| Grand total | 18,032 | 18,230 | 18,838 | r 19,615 | 20,472 | 14.4 |

r Revised.
[1] Includes Alaska and Hawaii.
[2] For details, see table 1 in the chapter "Statistical Summary of Mineral Production" of the 1964 Minerals Yearbook.

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## CONSUMPTION

**Consumption by Source.**—The calorific content of inputs of resources into the energy economy was equivalent to 51.7 quadrillion Btu, an increase of 4.2 percent from 1963. Table 6 shows demand for energy by source. During the year petroleum, including natural gas liquids, was 44 percent of total energy resources consumed; residue natural gas was 30 percent; and coal, 22 percent. The balance of consumption, less than 4 percent, came from hydropower and nuclear power. Among the various resources, natural gas consumption increased most during the year, 5.4 percent to 15.1 trillion cubic feet (equivalent to 15.6 quadrillion Btu). This was followed by bituminous coal, with a demand of 431 million tons (equivalent to 11.3 quadrillion Btu), an increase of 5.3 percent. Consumption of petroleum products including natural gas liquids rose to 4,050 million barrels (equivalent to 22.4 quadrillion Btu) and 3.2 percent greater than in 1963. Hydropower use which had declined in 1963 increased during the year, and nuclear power made modest gains as several new plants became operative.

**Consumption by Consuming Sector.**—Table 7 shows composite energy balances for the United States by energy source and consuming sector. Table 8 shows apparent consumption by source in conventional units. Tables 9 to 13 show separate supply and demand balances for major mineral energy resources that contribute to the balances in table 7.[2]

**TABLE 6.—Calculated consumption of mineral energy resources, and electricity from hydropower and nuclear power in British thermal units (Btu), and percent contributed by each in the United States [1]**

| Year | Trillion Btu | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Bituminous coal and lignite | Anthracite | Crude petroleum | Petroleum products net, imports | Natural gas dry (processed) | Natural gas liquids | Electricity | | Total |
| | | | | | | | Hydropower | Nuclear power | |
| 1960 | 9,967 | 447 | 17,172 | 1,436 | 12,736 | 1,427 | 1,626 | 5 | 44,816 |
| 1961 | 9,809 | 404 | 17,372 | 1,617 | 13,228 | 1,498 | 1,628 | 17 | 45,573 |
| 1962 | 10,160 | 363 | 17,853 | 1,809 | 14,027 | 1,605 | 1,780 | 23 | 47,620 |
| 1963 | 10,722 | 361 | 18,434 | 1,797 | 14,843 | 1,668 | 1,740 | 33 | 49,598 |
| 1964 | 11,295 | 365 | 18,742 | 1,965 | 15,648 | 1,769 | 1,858 | 34 | 51,676 |
| | Percentage | | | | | | | | |
| 1960 | 22.2 | 1.0 | 38.4 | 3.2 | 28.4 | 3.2 | 3.6 | ---------- | 100.0 |
| 1961 | 21.5 | 0.9 | 38.1 | 3.5 | 29.0 | 3.3 | 3.6 | 0.1 | 100.0 |
| 1962 | 21.3 | 0.8 | 37.4 | 3.8 | 29.5 | 3.4 | 3.7 | 0.1 | 100.0 |
| 1963 | 21.7 | 0.7 | 37.2 | 3.6 | 29.8 | 3.4 | 3.5 | 0.1 | 100.0 |
| 1964 | 21.8 | 0.7 | 36.5 | 3.8 | 30.1 | 3.4 | 3.6 | 0.1 | 100.0 |

[1] Heat values employed are anthracite, 12,700 Btu per pound; bituminous coal and lignite, 13,100 Btu per pound; crude oil, 5,800,000 Btu per barrel; weighted average British thermal units for petroleum products obtained by using 5,248,000 gasoline, 5,670,000 kerosine, 5,825,000 distillate, 6,287,000 residual, 6,064,800 lubricants, 5,537,280 wax, 6,636,000 asphalt, and 5,796,000 miscellaneous; natural gas dry, 1,035 Btu per cubic foot; natural gas liquids weighted average British thermal units based on production of natural gasoline at 110,000 Btu per gallon, and LP-gas at 95,500 Btu per gallon. Hydropower and nuclear power converted to coal equivalent at the prevailing rate of pounds of coal per kilowatt-hour each year at central electric stations, using 12,000 Btu per pound.

[2] See: Morrison, Warren E. Summary Energy Balances for the United States: Selected Years 1947–62. Bureau of Mines Information Circular 8242, 1964, 32 pp. (Showing comparable balances for years preceding 1963.)

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**TABLE 7.—United States gross consumption of energy resources by major sources and consuming sectors [1]**

(Trillion Btu)

| Consuming sectors | Anthracite | Bituminous and lignite | Natural gas dry [2] | Petroleum [3] | Hydropower [4] | Nuclear [4] | Total gross energy |
|---|---|---|---|---|---|---|---|
| Household and commercial: | | | | | | | |
| 1961 | 129 | 783 | 4,477 | 5,028 | ---------- | ---------- | 10,417 |
| 1962 | 121 | 799 | 4,849 | 5,227 | ---------- | ---------- | 10,996 |
| 1963 | 103 | 671 | 5,027 | 5,258 | ---------- | ---------- | 11,059 |
| 1964 | 85 | 560 | 5,343 | 5,193 | ---------- | ---------- | 11,181 |
| Industrial: | | | | | | | |
| 1961 | 46 | 4,693 | 6,025 | 3,682 | ---------- | ---------- | 14,446 |
| 1962 | 49 | 4,762 | 6,298 | 3,880 | ---------- | ---------- | 14,984 |
| 1963 | 57 | 5,015 | 6,776 | 3,994 | ---------- | ---------- | 15,842 |
| 1964 | 46 | 5,362 | 7,136 | 4,052 | ---------- | ---------- | 16,596 |
| Transportation: [5] | | | | | | | |
| 1961 | (neg) | 22 | 391 | 10,575 | ---------- | ---------- | 10,988 |
| 1962 | (neg) | 20 | 396 | 11,001 | ---------- | ---------- | 11,417 |
| 1963 | (neg) | 19 | 439 | 11,506 | ---------- | ---------- | 11,964 |
| 1964 | (neg) | 20 | 451 | 12,067 | ---------- | ---------- | 12,538 |
| Electricity generation, utilities: [6] | | | | | | | |
| Fuel burning plants: | | | | | | | |
| 1961 | 64 | 4,311 | 1,889 | 577 | ---------- | ---------- | 6,841 |
| 1962 | 58 | 4,590 | 2,084 | 579 | ---------- | ---------- | 7,251 |
| 1963 | 55 | 5,017 | 2,218 | 600 | ---------- | ---------- | 7,890 |
| 1964 | 57 | 5,353 | 2,403 | 636 | ---------- | ---------- | 8,449 |
| Hydropower and nuclear plants: | | | | | | | |
| 1961 | ---------- | ---------- | ---------- | ---------- | 1,628 | 17 | 1,645 |
| 1962 | ---------- | ---------- | ---------- | ---------- | 1,780 | 23 | 1,803 |
| 1963 | ---------- | ---------- | ---------- | ---------- | 1,740 | 33 | 1,773 |
| 1964 | ---------- | ---------- | ---------- | ---------- | 1,858 | 34 | 1,892 |
| Miscellaneous and unaccounted for: | | | | | | | |
| 1961 | 165 | ---------- | 446 | 625 | ---------- | ---------- | 1,236 |
| 1962 | 135 | ---------- | 454 | 580 | ---------- | ---------- | 1,169 |
| 1963 | 146 | ---------- | 383 | 541 | ---------- | ---------- | 1,070 |
| 1964 | 177 | ---------- | 315 | 528 | ---------- | ---------- | 1,020 |
| Total gross energy: | | | | | | | |
| 1961 | 404 | 9,809 | 13,228 | 20,487 | 1,628 | 17 | 45,573 |
| 1962 | 363 | 10,160 | 14,027 | 21,267 | 1,780 | 23 | 47,620 |
| 1963 | 361 | 10,722 | 14,843 | 21,899 | 1,740 | 33 | 49,598 |
| 1964 | 365 | 11,295 | 15,648 | 22,476 | 1,858 | 34 | 51,676 |

[1] Gross energy is that contained in all types of commercial energy at time it is incorporated in economy, whether energy is produced domestically or imported. Gross energy comprises inputs of primary fuels (or the derivatives) and outputs of hydropower and nuclear power converted to theoretical energy inputs. Gross energy includes energy used for production, processing, and transportation of energy proper.
[2] Excludes natural gas liquids.
[3] Petroleum products including still gas, liquefied refinery gas, and natural gas liquids.
[4] Represents outputs of hydropower and nuclear power converted to theoretical energy inputs at prevailing rate of pounds of coal per kilowatt-hour at central electric stations, using 12,000 Btu per pound of coal. Excludes inputs for power generated by nonutility plants, which are included within the other consuming sectors.
[5] Includes bunkers and military transportation.

**TABLE 8.—Apparent consumption of energy resources and selected related products**

| Commodity | 1963 | 1964 | Percent change from 1963 |
|---|---|---|---|
| Primary energy resources: | | | |
| Bituminous coal.....million net tons | 409.2 | 431.1 | +5.4 |
| Crude petroleum, runs to stills.....million barrels | 3,170.7 | 3,241.6 | +2.2 |
| Natural gas [1].....million cubic feet | 14,341.3 | 15,118.2 | +6.1 |
| Anthracite.....million net tons | r 14.1 | 14.4 | +2.1 |
| Hydropower.....million kilowatt-hours | 168,869.0 | 180,033.0 | +6.6 |
| Nuclear power.....do | 3,212.0 | 3,341.0 | +4.0 |
| Products: | | | |
| All oils, domestic product demand [2].....million barrels | r 3,924.5 | 4,050.2 | +3.2 |
| Coke.....million net tons | 55.0 | 62.6 | +13.8 |
| Petroleum asphalt.....do | 21.3 | 21.3 | +2.3 |

r Revised.
[1] Residue gas excludes extraction loss but includes transmission loss.
[2] Includes natural gas liquids.

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**TABLE 9.—Supply and demand for anthracite, domestic**

| | 1963 | | 1964 | |
|---|---|---|---|---|
| | Thousand net tons | Trillion Btu | Thousand net tons | Trillion Btu |
| Supply: | | | | |
| Production [1] | 18,267.0 | 464.0 | 17,184.0 | 436.5 |
| Imports | | | | |
| Exports | −3,353.2 | −85.2 | −1,575.1 | −40.0 |
| Stock change | | | | |
| Losses, gains, and unaccounted for | −713.8 | −18.2 | −1,208.9 | −30.7 |
| Total | 14,200.0 | 360.6 | 14,400.0 | 365.8 |
| Demand by major consuming sectors: [2] | | | | |
| Household and commercial [3] | 4,055.0 | 103.0 | 3,334.0 | 84.7 |
| Industrial [4] | 2,232.0 | 56.7 | 1,803.0 | 45.8 |
| Transportation [5] | (6) | (6) | (6) | (6) |
| Electricity generation, utilities | 2,155.0 | 54.7 | 2,239.0 | 56.9 |
| Miscellaneous and unaccounted for | 5,758.0 | 146.2 | 7,024.0 | 178.4 |
| Total | 14,200.0 | 360.6 | 14,400.0 | 365.8 |

[1] Includes use by producers for power and heat.
[2] With the exception of small quantities used as raw material for coal chemicals, all anthracite is used for fuel and power.
[3] Data represent "retail dealer deliveries to other consumers". These are mainly household and commercial users, with some unknown portion of use by small industries.
[4] Includes consumption by coke plants, steel and rolling mills, and other industrial users.
[5] Includes bunkers and military transportation.
[6] Data not available. Believed to be small and of minor significance.

**TABLE 10.—Supply and demand for bituminous coal and lignite, domestic**

| | 1963 | | 1964 | |
|---|---|---|---|---|
| | Thousand net tons | Trillion Btu | Thousand net tons | Trillion Btu |
| Supply: | | | | |
| Production [1] | 458,928.2 | 12,023.9 | 486,998.0 | 12,759.3 |
| Imports | 172.2 | 4.5 | 293.1 | 7.7 |
| Exports | −47,078.4 | −1,233.4 | −47,969.4 | −1,256.8 |
| Stock change | −450.8 | −11.8 | −491.1 | −12.9 |
| Losses, gains, and unaccounted for | −2,346.2 | −61.6 | −7,714.6 | −202.1 |
| Total | 409,225.0 | 10,721.6 | 431,116.0 | 11,295.2 |
| Demand by major consuming sectors: | | | | |
| Fuel and power: | | | | |
| Household and commercial [2] | 23,548.0 | 671.0 | 19,615.0 | 560.2 |
| Industrial [3] | 171,527.3 | 4,888.0 | 182,878.0 | 5,222.6 |
| Transportation [4] | 670.0 | 19.1 | 711.0 | 20.3 |
| Electricity generation, utilities | 209,038.0 | 5,016.9 | 223,032.0 | 5,352.7 |
| Total | 404,783.3 | 10,595.0 | 426,236.0 | 11,155.8 |
| Raw material: [5] Industrial: | | | | |
| Crude light oil | 1,090.8 | 31.1 | 1,243.0 | 35.5 |
| Crude coal tar | 3,350.9 | 95.5 | 3,637.0 | 103.9 |
| Total | 4,441.7 | 126.6 | 4,880.0 | 139.4 |
| Total | 409,225.0 | 10,721.6 | 431,116.0 | 11,295.2 |

[1] Includes use by producers for power and heat.
[2] Data represent "retail deliveries to other consumers". These are mainly household and commercial users, with some unknown portion of use by small industries.
[3] Includes consumption by coke plants, steel and rolling mills, and other industrial users.
[4] Includes bunkers and military transportation.
[5] Coal equivalent based on British thermal unit value of raw materials used for coal chemicals.



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**TABLE 11.—Supply and demand for natural gas, domestic**

| | 1963 | | 1964 | |
|---|---|---|---|---|
| | Million cubic feet | Trillion Btu | Million cubic feet | Trillion Btu |
| **Supply:** | | | | |
| Production [1] | 14,746,661 | 16,271.3 | 15,546,592 | 17,137.8 |
| Imports | 406,204 | 420.4 | 441,325 | 457.0 |
| Exports | −16,957 | −17.6 | −16,763 | −17.3 |
| Stock change | −130,772 | −135.3 | −129,507 | −134.0 |
| Transfers out extraction loss [2] | −670,251 | −1,702.4 | −722,565 | −1,796.0 |
| Losses, gains, and unaccounted for | 6,370 | 6.6 | −908 | |
| Total | 14,341,255 | 14,843.0 | 15,118,174 | 15,647.5 |
| **Demand by major consuming sectors:** | | | | |
| Fuel and power: | | | | |
| Household and commercial | 4,856,804 | 5,026.8 | 5,162,009 | 5,342.7 |
| Industrial | 6,259,334 | 6,478.4 | 6,607,581 | 6,838.8 |
| Transportation | 423,783 | 438.6 | 435,570 | 450.8 |
| Electricity generation, utilities | 2,142,930 | 2,217.9 | 2,321,889 | 2,403.2 |
| Total | 13,682,851 | 14,161.7 | 14,527,049 | 15,035.5 |
| Raw material: [3] Industrial: | | | | |
| Carbon black | 117,378 | 121.5 | 106,759 | 110.5 |
| Other chemicals [4] | • 170,000 | • 176.0 | • 180,000 | • 186.3 |
| Total | 287,378 | 297.5 | 286,759 | 296.8 |
| Miscellaneous and unaccounted for | 371,026 | 383.8 | 304,366 | 315.2 |
| Total | 14,341,255 | 14,843.0 | 15,118,174 | 15,647.5 |

• Estimate.

[1] Marketed production includes wet gas sold or consumed by producers, losses in transmission, producers additions to storage, and increases in gas pipeline fill; excludes repressuring and vented and wasted. British thermal unit value of production is for wet gas prior to extraction of natural gas liquids. Higher values assigned to extraction loss are reflected in value of production for each year.

[2] Extraction loss from cycling plants represents offtake of natural gas for natural gas liquids as reported to Bureau of Mines. Values for extraction loss are based on annual outputs of natural gasoline and associated products at 110,000 Btu per gallon and annual outputs of liquefied petroleum gases at 95,500 Btu per gallon.

[3] Includes some fuel and power use by raw materials industries.

[4] Estimated from partial data.

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**TABLE 12.—Supply and demand for petroleum,[1] domestic**

| | 1963 | | 1964 | |
|---|---|---|---|---|
| | Million bbl | Trillion Btu | Million bbl | Trillion Btu |
| **Supply:** | | | | |
| Crude oil:[2] | | | | |
| Production | 2,752.7 | 15,740.7 | 2,805.1 | 15,924.6 |
| Net imports | 411.0 | 2,350.2 | 437.2 | 2,482.0 |
| Stock change | 14.6 | 83.5 | 7.3 | 41.4 |
| Losses and transfers for use as crude | −7.6 | −43.5 | −8.0 | −45.6 |
| Total | 3,170.7 | 18,130.9 | 3,241.6 | 18,402.4 |
| Petroleum input, runs to stills: | | | | |
| Crude oil[2] | 3,170.7 | 18,130.9 | 3,241.6 | 18,402.4 |
| Transfers in natural gas liquids[3] | 190.2 | 818.8 | 195.0 | 901.0 |
| Total | 3,360.9 | 18,949.7 | 3,436.6 | 19,303.4 |
| Output: | | | | |
| Refined products | 3,360.9 | 18,949.7 | 3,436.6 | 19,303.4 |
| Unfinished oils, net | 31.9 | 179.9 | 27.3 | 153.3 |
| Overage or loss | 73.6 | 415.0 | 79.3 | 445.4 |
| Total | 3,466.4 | 19,544.6 | 3,543.2 | 19,902.1 |
| Imports[4] | 362.1 | 2,294.1 | 388.2 | 2,440.6 |
| Exports | −74.2 | −417.2 | −72.4 | −406.7 |
| Stock change, including natural gas liquids | −13.0 | −89.6 | −11.0 | −61.8 |
| Transfers in, natural gas liquids[3 5] | 188.2 | 883.6 | 226.0 | 895.0 |
| Losses, gains, and unaccounted for | −5.0 | −265.5 | −23.8 | −392.9 |
| Total | 3,924.5 | 21,950.0 | 4,050.2 | 22,476.3 |
| **Demand by major consuming sectors:** | | | | |
| Fuel and power: | | | | |
| Household and commercial | 790.8 | 4,433.6 | 779.7 | 4,352.4 |
| Industrial | 455.9 | 2,738.8 | 472.9 | 2,823.3 |
| Transportation[6] | 2,146.7 | 11,506.1 | 2,251.1 | 12,066.6 |
| Electricity generation, utilities | 95.7 | 599.8 | 101.4 | 635.7 |
| Total | 3,489.1 | 19,278.3 | 3,605.1 | 19,878.0 |
| Raw material:[7] | | | | |
| Household and commercial: Asphalt and road oils | 124.2 | 824.2 | 126.7 | 840.8 |
| Industrial: | | | | |
| Petrochemicals | 156.2 | 714.2 | 165.7 | 756.3 |
| Other nonfuel use | 89.9 | 541.0 | 79.0 | 472.5 |
| Total | 370.3 | 2,079.4 | 371.4 | 2,069.6 |
| Miscellaneous and unaccounted for | 65.1 | 592.3 | 73.7 | 428.7 |
| Total | 3,924.5 | 21,950.0 | 4,050.2 | 22,476.3 |

[1] Supply and demand for crude oil and petroleum products. Petroleum products include products refined and processed from crude oil, including still gas and liquefied refinery gas; also natural gas liquids transferred from natural gas.

[2] Value for crude oil for each year shown is based on average British thermal unit value of total output of petroleum products (including refinery fuel and losses) adjusted to exclude natural gas liquids inputs and their implicitly derived values. Value for net imports of crude is based on the average value of crude runs to stills.

[3] Values for natural gas liquids for each year shown are implicitly derived from weighted averages of major natural gas liquids, with natural gasoline and associated product converted at 110,000 Btu per gallon and liquefied petroleum gases at 95,500 Btu per gallon.

[4] Value for imported refined products for each year shown is based on the value of residual fuel and unfinished oils. The value for exports of refined products is based on the average value of domestic petroleum products output.

[5] Includes natural gas liquids other than those channeled into refinery input as follows: petrochemical feedstocks, direct uses for fuel and power; and other uses.

[6] Includes bunkers and military transportation.

[7] Includes some fuel and power use by raw materials industries.

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**TABLE 13.—Petroleum consumption by major products,[1] and by major consuming groups, domestic**

| | 1963 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Household and commercial | | Industrial | | Transportation[2] | | Electricity generation, utilities | | Miscellaneous and unaccounted for | | Total domestic product demand | |
| | Million bbl | Trillion Btu | Million bbl | Trillion Btu | Million bbl | Trillion Btu | Million bbl | Trillion Btu | Million bbl | Trillion Btu | Million bbl | Trillion Btu |
| Fuel and power: | | | | | | | | | | | | |
| Liquefied gases | 120.3 | 482.6 | 20.2 | 81.0 | 23.8 | 95.4 | | | | | 164.3 | 659.0 |
| Military jet fuel | | | | | 116.6 | 624.4 | | | | | 116.6 | 624.4 |
| Commercial jet fuel | | | | | 75.1 | 425.8 | | | | | 75.1 | 425.8 |
| Gasoline | | | | | 1,634.9 | 8,580.0 | | | | | 1,634.9 | 8,580.0 |
| Kerosine | 79.9 | 453.0 | 14.1 | 80.0 | | | | | | | 94.0 | 533.0 |
| Distillate fuel | 465.4 | 2,711.0 | 52.1 | 303.5 | 178.1 | 1,037.4 | 4.1 | 23.9 | | | 699.7 | 4,075.8 |
| Residual fuel | 125.2 | 787.0 | 196.3 | 1,234.1 | 118.2 | 743.1 | 91.6 | 575.9 | | | 531.3 | 3,340.1 |
| Still gas | | | 129.5 | 777.0 | | | | | | | 129.5 | 777.0 |
| Petroleum coke | | | 43.7 | 263.2 | | | | | | | 43.7 | 263.2 |
| Total | 790.8 | 4,433.6 | 455.9 | 2,738.8 | 2,146.7 | 11,506.1 | 95.7 | 599.8 | | | 3,489.1 | 19,278.3 |
| Raw material:[3] | | | | | | | | | | | | |
| Lubes, waxes, coke[4] | | | 73.0 | 439.6 | | | | | | | 73.0 | 439.6 |
| Asphalt and road oil | 124.2 | 824.2 | | | | | | | | | 124.2 | 824.2 |
| Petrochemical feedstock offtake[5] | | | 156.2 | 714.2 | | | | | | | 156.2 | 714.2 |
| Other[6] | | | 16.9 | 101.4 | | | | | | | 16.9 | 101.4 |
| Total | 124.2 | 824.2 | 246.1 | 1,255.2 | | | | | | | 370.3 | 2,079.4 |
| Miscellaneous and unaccounted for | | | | | | | | | 65.1 | 592.3 | 65.1 | 592.3 |
| Total product demand | 915.0 | 5,257.8 | 702.0 | 3,994.0 | 2,146.7 | 11,506.1 | 95.7 | 599.8 | 65.1 | 592.3 | 3,924.5 | 21,950.0 |

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| | 1964 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fuel and power:** | | | | | | | | | | | | |
| Liquefied gases | 130.4 | 523.0 | 29.0 | 116.3 | 28.0 | 112.4 | | | | | 187.4 | 751.7 |
| Military jet fuel | | | | | 118.6 | 635.1 | | | | | 118.6 | 635.1 |
| Commercial jet fuel | | | | | 87.9 | 498.4 | | | | | 87.9 | 498.4 |
| Gasoline | | | | | 1,704.1 | 8,943.1 | | | | | 1,704.1 | 8,943.1 |
| Kerosine | 71.2 | 403.7 | 17.7 | 100.4 | | | | | | | 88.9 | 504.1 |
| Distillate fuel | 451.9 | 2,632.3 | 52.0 | 302.9 | 188.5 | 1,098.0 | 3.8 | 22.1 | | | 696.2 | 4,055.3 |
| Residual fuel | 126.2 | 793.4 | 200.3 | 1,259.3 | 124.0 | 779.6 | 97.6 | 613.6 | | | 548.1 | 3,445.9 |
| Still gas | | | 131.3 | 787.8 | | | | | | | 131.3 | 787.8 |
| Petroleum coke | | | 42.6 | 256.6 | | | | | | | 42.6 | 256.6 |
| Total | 779.7 | 4,352.4 | 472.9 | 2,823.3 | 2,251.1 | 12,066.6 | 101.4 | 635.7 | | | 3,605.1 | 19,878.0 |
| **Raw material:** [2] | | | | | | | | | | | | |
| Lubes, waxes, coke [4] | | | 77.3 | 465.7 | | | | | | | 77.3 | 465.7 |
| Asphalt and road oil | 126.7 | 840.8 | | | | | | | | | 126.7 | 840.8 |
| Petrochemical feedstock offtake [7] | | | 165.7 | 756.3 | | | | | | | 165.7 | 756.3 |
| Other [8] | | | 1.7 | 6.8 | | | | | | | 1.7 | 6.8 |
| Total | 126.7 | 840.8 | 244.7 | 1,228.8 | | | | | | | 371.4 | 2,069.6 |
| Miscellaneous and unaccounted for | | | | | | | | | 73.7 | 528.7 | 73.7 | 528.7 |
| Total product demand | 906.4 | 5,193.2 | 717.6 | 4,052.1 | 2,251.1 | 12,066.6 | 101.4 | 635.7 | 73.7 | 528.7 | 4,050.2 | 22,476.3 |

[1] Includes liquefied refinery gas and natural gas liquids.
[2] Includes bunkers and military transportation.
[3] Includes some fuel and power use by raw materials industries.
[4] Includes portions of petroleum coke estimated to be consumed in nonfuel uses.
[5] Partly estimated. Includes LPG and LRG, 103.8 million barrels and 416.3 trillion Btu; naphtha, 22.0 million barrels and 115.5 trillion Btu; still gas, 7.8 million barrels and 46.8 trillion Btu; "Other," 22.6 million barrels and 135.6 trillion Btu.
[6] Partly estimated. Includes LPG used for secondary recovery, 0.5 million barrels and 2.1 trillion Btu; "Other," 16.4 million barrels and 99.3 trillion Btu.
[7] Includes LRG, 47.2 million barrels and 189.3 trillion Btu; LPG 45.4 million barrels and 182.1 trillion Btu; liquefied gases for synthetic rubber, 15.5 million barrels and 62.2 trillion Btu; naphtha, −400 degrees, 24.6 million barrels and 129.1 trillion Btu; still gas, 7.7 million barrels and 46.2 trillion Btu; "Other," +400 degrees, 25.3 million barrels and 147.4 trillion Btu.
[8] Includes LPG used for secondary recovery, 0.2 million barrels and 0.8 trillion Btu; "Other," 1.5 million barrels and 6.0 trillion Btu.

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Although smallest of the major markets for energy resources, electric utilities have the fastest rate of growth. Inputs of resources at fuel-burning thermal plants, together with theoretical inputs at hydropower and nuclear power plants, amounted to one-fifth of total energy consumption, an increase of 7 percent during the year. The ratio of power output at conventional thermal plants to outputs at hydro and nuclear plants in 1964 was about 4.5 to 1. Bituminous coal remained the principal energy source at powerplants and accounted for almost two-thirds of total resource inputs at such plants. The remaining third came from natural gas and petroleum products, the latter consisting mainly of residual fuel oil. Utilities have been responsible for much of the increase in coal utilization in recent years, and in 1964 consumed almost half of the total output of bituminous coal. Table 14 shows electric energy sales to ultimate consumers by region. In 1963, the latest year for which data are available, total sales increased 7.1 percent. This includes utility sales and sales by nonutility plants. The East-North-Central region was the largest power-consuming area, accounting for 22 percent of total sales.

Industry remained the largest of the energy markets in 1964. Energy resources consumed directly as fuel or raw material in this sector accounted for one-third of total energy consumption. In addition, industry absorbed about 45 percent of the output of electricity by utilities. In direct consumption of resources, natural gas accounted for 43 percent of sector energy inputs; coal, for 33 percent; and petroleum, for 24 percent. Of petroleum products consumed by industry, 473 million barrels was consumed as fuel and 245 million barrels was consumed for nonfuel uses. Among the latter is the offtake for the petrochemical industry which amounted to 166 million barrels of natural gas liquids and related petroleum products. Industrial consumption of bituminous coal increased 6.6 percent to 183 million tons. Increased use of coal was related to increased output of coking coal to meet the growing coke requirements of the iron and steel industry.

Direct consumption of energy resources for household and commercial use amounted to one-fifth of total energy consumption. This sector also absorbed an estimated 55 percent of the total output of utility power. Natural gas and petroleum were the main products consumed as direct fuels, mainly for space heating. Coal use continued to decline, and for the first time petroleum demand did also. Natural gas continued to command an increasing portion of the space-heat market.

For transportation, direct fuels accounted for the majority of demand—only small quantities of utility power are used. Petroleum products accounted for 96 percent of sector consumption, and the remaining 4 percent was natural gas utilized within the pipeline system either for pumping or for pipeline fill. Motor and aviation gasoline accounted for three-quarters of petroleum demand in transportation; military and commercial jet fuel, for 9 percent; and distillate and residual fuel oil combined, for 14 percent.

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**TABLE 14.—Electrical energy sales to ultimate customers in the United States**

(Million kilowatt-hours)

| Region | 1958 | | | 1959 | | |
|---|---|---|---|---|---|---|
| | Total consumption | Residential [1] | Industrial and commercial | Total consumption | Residential [1] | Industrial and commercial |
| New England | 22,573 | 8,149 | 13,644 | 24,790 | 8,701 | 15,237 |
| Middle Atlantic | 89,626 | 25,466 | 57,925 | 98,021 | 27,401 | 63,706 |
| East North Central | 125,797 | 34,548 | 85,820 | 139,596 | 37,393 | 96,380 |
| West North Central | 34,717 | 14,673 | 18,829 | 38,157 | 16,106 | 20,780 |
| South Atlantic | 69,817 | 24,446 | 43,181 | 77,763 | 26,648 | 48,676 |
| East South Central | 78,794 | 14,943 | 63,102 | 84,015 | 16,437 | 66,781 |
| West South Central | 46,419 | 13,729 | 30,275 | 51,612 | 15,220 | 33,766 |
| Mountain | 23,714 | 7,288 | 15,209 | 26,010 | 8,105 | 16,541 |
| Pacific | 77,704 | 26,889 | 48,251 | 86,779 | 30,390 | 53,617 |
| Total | 569,161 | 170,131 | 376,236 | 626,743 | 186,401 | 415,484 |
| | 1960 | | | 1961 [2] | | |
| New England | 26,570 | 9,213 | 16,434 | 28,652 | 10,140 | 17,432 |
| Middle Atlantic | 106,013 | 28,594 | 69,534 | 112,080 | 30,785 | 73,095 |
| East North Central | 147,088 | 39,541 | 102,033 | 151,885 | 41,748 | 104,358 |
| West North Central | 44,176 | 17,368 | 25,419 | 46,415 | 18,402 | 26,260 |
| South Atlantic | 86,388 | 29,368 | 54,334 | 93,274 | 32,129 | 57,601 |
| East South Central | 87,543 | 18,504 | 68,049 | 88,821 | 19,075 | 68,736 |
| West South Central | 57,363 | 17,290 | 37,013 | 60,399 | 17,331 | 39,831 |
| Mountain | 29,611 | 8,947 | 19,353 | 33,514 | 8,538 | 23,430 |
| Pacific [3] | 98,447 | 33,884 | 61,129 | 105,688 | 30,873 | 71,548 |
| Total [3] | 683,199 | 202,709 | 453,298 | 720,728 | 209,021 | 482,291 |
| | 1962 [2] | | | 1963 | | |
| New England | 30,558 | 10,738 | 18,655 | 32,086 | 11,263 | 19,596 |
| Middle Atlantic | 119,026 | 32,051 | 78,368 | 126,287 | 33,978 | 83,466 |
| East North Central | 162,756 | 44,046 | 112,397 | 172,816 | 45,914 | 120,037 |
| West North Central | 51,257 | 20,384 | 28,954 | 54,005 | 20,985 | 31,076 |
| South Atlantic | 102,766 | 34,915 | 63,918 | 110,782 | 37,653 | 68,885 |
| East South Central | 92,624 | 21,172 | 70,288 | 98,883 | 23,061 | 74,580 |
| West South Central | 68,930 | 20,412 | 45,069 | 76,946 | 22,969 | 49,993 |
| Mountain | 35,897 | 9,192 | 25,080 | 38,225 | 9,965 | 26,573 |
| Pacific [3] | 112,274 | 33,504 | 75,282 | 120,781 | 35,884 | 80,709 |
| Total [3] | 776,088 | 226,414 | 518,011 | 830,811 | 241,692 | 554,915 |

[1] Includes rural.
[2] Rural included in all three classes.
[3] Includes Alaska and Hawaii in 1960, 1962, and 1963.

Source: Edison Electric Institute, Statistical Yearbook of the Electric Utility Industry, 1958 through 1963.

**Projections of Energy Demand.**—Projections of the future demand for energy resources and forecasts of selected economic indicators are shown in table 15. Growth rates for projections and forecasts are based on 1964 data and extend to 1980. Total energy is projected to expand at the rate of 3.2 percent during the 16-year period; the rate for 1947–63 was 2.5 percent. Demand for natural gas and petroleum is expected to expand at a slower rate than the last 16 years. Conversely, coal demand which declined throughout most of the 1947–63 period is projected to increase at rates ranging from 2.2 to 3.7 percent. The range of the coal projection reflects the uncertainty concerning

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the future role of coal in power generation as this relates to increasing air pollution and encroachment of nuclear power on conventional thermal utility power. Also, improved technology in the iron and steel industry continues to decrease the ratio of coke required per ton of pig iron output. Utility power output is projected to increase at the rate of 6.6 percent during the forecast period. The portion of the utility market to be supplied by nuclear energy in 1980 is predicted to be 18 percent with 11 percent to be supplied by hydropower and 71 percent supplied by conventional fuel-burning plants. This analysis is predicated with the lower rate of 2.2 percent shown for coal growth in table 15.

**TABLE 15.—Projections: Mineral energy resources and general economic indicators**

| | 1964 actual | 1980 projection | 1964–80 projected growth rate (percent per year) |
|---|---|---|---|
| Population—thousands | 192,120 | [1] 245,313 | 1.6 |
| Labor force—do | 76,971 | [2] 101,408 | 1.7 |
| Gross national product—billions of 1954 dollars | 516 | [3] 955 | 3.9 |
| Index of industrial production (1957–59=100) | 132 | [3] 250 | 4.1 |
| Energy consumption-United States—trillion Btu | 51,676 | [4] 85,934 | 3.2 |
| Petroleum consumption, including natural gas liquids—million barrels | 3,974 | [5] 6,530 | 3.1 |
| Natural gas consumption—billion cubic feet | 15,536 | [5] 25,619 | 3.2 |
| Coal consumption—million tons | 445 | [6] 624–800 | 2.2–3.7 |
| Electrical energy, utility, consumption—billion kilowatt-hours | 980 | [5] 2,739 | 6.6 |

[1] Bureau of the Census. Current Population Reports. Series P-25, No. 286.
[2] Bureau of Labor Statistics. Special Labor Force Report No. 49.
[3] Division of Economic Analysis, Bureau of Mines, U.S. Department of the Interior.
[4] U.S. Department of the Interior. An Appraisal of the Petroleum Industry of the United States. January 1965.
[5] Vogely, William A. Pattern of Energy Consumption in the United States. Paper in General Papers prepr. vol., 149th Meeting, Am. Chem. Soc., Division of Fuel Chemistry, Symposium of Fuel and Energy Economics, Detroit, Mich., Apr. 4–9, 1965, pp. 205–221.
[6] Lower of range from source 5. Higher of range projection by Division of Bituminous Coal, Bureau of Mines.

## PHYSICAL STOCKS

Stocks of the major energy resources are shown in table 16. Along with significant expansion in bituminous coal production, stocks rose 6.7 percent. The sharp rise in demand for metallurgical coke for the iron and steel industry caused coke stocks to decline below the 2-million-ton level. There were no appreciable shifts in stocks of crude petroleum or petroleum products during the year. However, reported stocks of natural gas declined after rising steadily for a number of years as additional storage facilities were constructed near major consuming areas for meeting seasonable peak demand.

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## TRANSPORTATION

Natural gas is moved almost entirely by pipeline. Crude petroleum and related products are moved by pipeline, rail, water, and highway. Coal is transported primarily by rail, with some movement by water and truck. In 1962, the latest year for which data are available, total petroleum pipeline mileage was 200,543 miles (table 17)—including gathering lines and trunklines for crude petroleum and products. In 1963 there were 710,200 miles of utility gas pipelines (table 18). Of the total, 98 percent were natural gaslines, and the remaining 2 percent were manufactured, mixed, and liquefied petroleum gasolines.

**TABLE 16.—Physical stocks of mineral energy resources and related products at yearend**

(Producers stocks, unless otherwise indicated)

| Fuel | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Coal and related products: [1] | | | | | |
| Bituminous and lignite [2]—net tons | 76,898,317 | 74,449,230 | 72,577,910 | 73,028,665 | 77,939,559 |
| Coke—do | 4,738,088 | 4,041,873 | 3,906,811 | 2,884,931 | 1,971,892 |
| Petroleum and related products: [3] | | | | | |
| Carbon black—thousand pounds | 292,982 | 287,899 | 293,434 | r 254,216 | 231,121 |
| Crude petroleum and petroleum products—thousand barrels | 784,558 | 825,074 | 834,296 | 835,559 | 839,235 |
| Crude petroleum—do | 239,800 | 244,664 | 252,011 | 237,361 | 230,057 |
| Natural gas liquids—do | 28,931 | 37,067 | 31,385 | 33,747 | 35,679 |
| Gasoline—do | 194,774 | 184,167 | 188,683 | 190,937 | 190,512 |
| Distillate fuel oil—do | 138,455 | 152,018 | 143,961 | 156,677 | 155,846 |
| Residual fuel oil—do | 44,870 | 44,869 | 49,775 | 47,538 | 40,403 |
| Petroleum asphalt—do | 12,991 | 12,999 | 14,252 | 14,354 | 14,234 |
| Other refined products—do | 124,737 | 149,290 | 154,229 | 154,945 | 163,507 |
| Natural gas [4]—billion cubic feet | 2,184 | 2,344 | 2,504 | 2,745 | 2,313 |

r Revised.
[1] Series on anthracite stocks in ground storage has been discontinued.
[2] Stocks at industrial, consumer, and retail yards and on upper lake docks.
[3] Stocks of petroleum and related products are calculated on a new basis beginning with 1962 due to product reclassification resulting from separately reported data for petrochemical feedstocks.
[4] American Gas Association.

**TABLE 17.—Mileage of petroleum pipelines in the United States, selected years**

(Miles)

| Year | Trunklines | | Gathering lines | Total |
|---|---|---|---|---|
| | Crude | Products | | |
| 1950 | 71,373 | 20,881 | 60,560 | 152,814 |
| 1953 | 75,228 | 27,236 | 68,040 | 170,504 |
| 1956 | 78,594 | 36,420 | 73,526 | 188,540 |
| 1959 | 70,317 | 44,483 | 75,182 | 189,982 |
| 1962 | 70,355 | 53,200 | 76,988 | 200,543 |

Source: Bureau of Mines, Crude Oil and Product Pipelines, Triennial.

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**TABLE 18.—Miles of utility gas main by type of gas and by type of main [1]**

| Type of gas and type of main | 1950 | 1955 | 1960 [2] | 1961 [2] | 1962 [2] | 1963 |
|---|---|---|---|---|---|---|
| All types: | | | | | | |
| Field and gathering | 32,850 | 45,680 | 55,850 | 56,730 | 58,680 | 60,980 |
| Transmission | 113,050 | 145,970 | 183,660 | 191,840 | 196,380 | 200,550 |
| Distribution | 241,570 | 305,090 | 391,440 | 410,390 | 428,170 | 448,670 |
| Total | 387,470 | 496,740 | 630,950 | 658,960 | 683,230 | 710,200 |
| Natural gas: | | | | | | |
| Field and gathering | 32,850 | 45,680 | 55,850 | 56,730 | 58,680 | 60,980 |
| Transmission | 109,360 | 142,490 | 181,770 | 189,990 | 194,970 | 199,630 |
| Distribution | 172,270 | 260,600 | 370,360 | 390,400 | 409,910 | 434,010 |
| Total | 314,480 | 448,770 | 607,980 | 637,120 | 663,560 | 694,620 |
| Manufactured gas: | | | | | | |
| Field and gathering | 0 | 0 | 0 | 0 | 0 | 0 |
| Transmission | 2,230 | 420 | 20 | 30 | 20 | (3) |
| Distribution | 53,190 | 11,540 | 1,550 | 1,480 | 1,480 | 1,490 |
| Total | 55,420 | 11,960 | 1,570 | 1,510 | 1,500 | 1,490 |
| Mixed gas: | | | | | | |
| Field and gathering | 0 | 0 | 0 | 0 | 0 | 0 |
| Transmission | 1,370 | 2,990 | 1,860 | 1,810 | 1,380 | 920 |
| Distribution | 10,620 | 28,450 | 17,590 | 16,640 | 15,080 | 11,890 |
| Total | 11,990 | 31,440 | 19,450 | 18,450 | 16,460 | 12,810 |
| Liquified petroleum gas: | | | | | | |
| Field and gathering | 0 | 0 | 0 | 0 | 0 | 0 |
| Transmission | 90 | 70 | 10 | 10 | 10 | 0 |
| Distribution | 5,490 | 4,500 | 1,940 | 1,870 | 1,700 | 1,280 |
| Total | 5,580 | 4,570 | 1,950 | 1,880 | 1,710 | 1,280 |

[1] Excludes service pipe. Data not adjusted to common diameter equivalent. Mileage shown as of end of each year.
[2] Includes data for Hawaii subsequent to 1959 and for natural gas only for Alaska subsequent to 1960.
[3] Less than 5 miles.

NOTE: For earlier years please refer to Historical Statistics of the Gas Industry.

Source: American Gas Association, Gas Facts 1963.

Rail transportation was the principal method for shipping coal in 1964. As shown in table 19, 349 million tons or 72 percent of total bituminous coal production during the year was shipped via railroad. Table 20 shows rail transportation of major energy resources. Coal, mainly bituminous, accounted for 88 percent of total energy resources shipped by rail in 1963, the latest year for which data are available. Freight costs of bituminous coal shipped by rail have declined in recent years owing to downward pressure on rates caused by interfuel competition in the electric utility market and to the continued transportation of the majority of powerplant coal by rail. Rail shipments of crude petroleum, gasoline, and fuel oil continued to decline during the year due to increasing competition from pipeline and truck distribution.

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Water transportation of major energy resources (table 21), increased during the year. About one-third of the total water movement of energy resources was of coal, while 17 percent was crude petroleum. Refined petroleum products of which gasoline is the largest component were 51 percent of the total.

**TABLE 19.—Methods of shipment of bituminous coal and lignite from mines and used at mines in the United States**

| Year | Method of shipment from mines | | | Used at mines [1] | Total production |
|---|---|---|---|---|---|
| | Shipped by rail and trucked to rail | Shipped by water and trucked to water | Trucked to final destination | | |
| | Thousand net tons | | | | |
| 1960 | 303,865 | 46,784 | 52,699 | 12,164 | 415,512 |
| 1961 | r 293,546 | r 46,348 | 51,044 | 12,039 | 402,977 |
| 1962 | r 307,328 | r 48,106 | 54,853 | 11,862 | 422,149 |
| 1963 | r 333,969 | r 50,664 | 60,901 | 13,374 | 458,928 |
| 1964 | 349,377 | 59,349 | 65,532 | 12,740 | 486,798 |
| | Percentage of total | | | | |
| 1960 | 73.1 | 11.3 | 12.7 | 2.9 | 100.0 |
| 1961 | r 72.9 | r 11.5 | 12.6 | 3.0 | 100.0 |
| 1962 | 72.8 | 11.4 | 13.0 | 2.8 | 100.0 |
| 1963 | r 72.8 | r 11.0 | 13.3 | 2.9 | 100.0 |
| 1964 | 71.7 | 12.2 | 13.5 | 2.6 | 100.0 |

r Revised.
[1] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.

**TABLE 20.—Rail transportation of mineral energy resources and related products in the United States [1]**

(Thousand short tons)

| Product | 1961 | 1962 | 1963 | Change from 1962 (percent) |
|---|---|---|---|---|
| Coal: | | | | |
| Anthracite [2] | 14,963 | 15,157 | 16,564 | +9 |
| Bituminous | 296,884 | 312,179 | 331,667 | +6 |
| Coke | 14,328 | 15,467 | 16,436 | +6 |
| Crude petroleum | 2,027 | 1,756 | 781 | −56 |
| Gasoline | 6,861 | 6,187 | 5,380 | −13 |
| Distillate and residual fuel oils | 6,369 | 6,209 | 5,812 | −6 |
| Asphalt | 2,810 | 2,853 | 2,894 | +1 |
| Other [3] | 15,482 | 15,824 | 16,140 | +2 |
| Total | 359,724 | 375,632 | 395,674 | +5 |

[1] Revenue freight originated, excluding forwarder and less than carload shipments, for which categories commodity detail is not available.
[2] Includes shipments to breakers and washeries.
[3] Includes lubricants, petroleum products, and gases.

Source: Interstate Commerce Commission, Freight Commodity Statistics, Class I Railroads in United States, for 3 years ended December 31 from 1961 to 1963.

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TABLE 21.—Water transportation of mineral energy resources and related products in the United States, by products [1]

(Thousand short tons)

| Product | 1962 | 1963 | 1964 [p] | Change from 1963 (percent) |
|---|---|---|---|---|
| Coal: | | | | |
| Anthracite | 573 | 423 | 390 | −8 |
| Bituminous | 136,765 | 141,673 | 154,936 | +9 |
| Coke | 686 | 573 | 558 | −3 |
| Crude petroleum | 80,970 | 83,236 | 79,998 | −4 |
| Gasoline | 92,896 | 98,177 | 93,827 | −4 |
| Distillate fuel oil | 79,001 | 77,357 | 71,153 | −8 |
| Residual fuel oil | 45,215 | 46,360 | 44,910 | −3 |
| Asphalt | 4,760 | 4,487 | 5,059 | +13 |
| Kerosine | 9,314 | 8,307 | 8,273 | (2) |
| Other [3] | 15,263 | 15,183 | 18,563 | +22 |
| Total | 465,443 | 475,776 | 477,667 | (2) |

[p] Preliminary.
[1] Domestic traffic only: Traffic with Canal Zone, the Virgin Islands, and military cargoes carried in Department of Defense vehicles are excluded.
[2] Less than 0.5 percent.
[3] Includes lubricants, jet fuel, naphthene, and briquets.

## LABOR AND PRODUCTIVITY

**Employment.**—Total employment in the mineral energy resources industries declined slightly in 1964 although oil and gas field services, one of the groups shown in table 22, increased about 2 percent. Table 23 shows a comparison of employment data in the mineral energy resources industries from three separate sources—the Bureau of Labor Statistics (BLS), the Bureau of Employment Security (BES), and the Bureau of Mines. Generally, the three series move together but in 1964 BES anthracite and petroleum employment data moved contrary to Bureau of Mines and BLS data. This anomaly resulted from differences in sources of information and methods used to construct the series. BLS data, a sample survey, were revised in December 1964 using a new benchmark (comprehensive counts of employment) adjusted to March 1963 payroll data. The BES data are compiled using company reports to State agencies under the unemployment security laws, while the Bureau of Mines data are compiled from questionnaires sent to producers. Injury-experience data and related employment information collected by the Bureau of Mines may be found in the chapter on Employment and Injuries.

**Productivity.**—While an index of labor output has not been computed for 1964, a continued trend toward increased mechanization and automation is expected to result in productivity increases in the mineral energy resources industries during 1964. As shown in table 24, output per production worker man-hour in petroleum refining and bituminous coal mining increased 5 and 6 percent, respectively, in 1963.

**Average Hours and Gross Earnings.**—Weekly and hourly earnings for all mining and manufacturing industries are shown in table 25. The largest increase was in hourly earnings paid to coal miners, resulting from increased wage rates and the trend to automation which requires a more skilled, higher paid labor force.

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**TABLE 22.—Total employment in the mineral energy resources industries**

(Thousands)

| Year and month | Mining | | | | | Manufacturing | | |
|---|---|---|---|---|---|---|---|---|
| | Bituminous | Other coal | Crude petroleum and natural gas fields | Oil and gas field services | Total | Petroleum refining | Other petroleum and coal products [1] | Total |
| 1960 | 168.5 | 17.6 | 178.2 | 131.1 | 495.4 | 177.2 | 34.7 | 211.9 |
| 1961 | 147.1 | 14.2 | 171.3 | 131.8 | 464.4 | 168.4 | 33.6 | 202.0 |
| 1962 | 140.0 | 11.9 | 167.6 | 130.4 | 449.9 | 160.5 | 34.7 | 195.2 |
| 1963 | 136.9 | 11.2 | 164.3 | 124.8 | 437.2 | 154.7 | 35.1 | 189.8 |
| 1964: | | | | | | | | |
| January | 137.3 | 11.2 | 161.4 | 123.7 | 433.6 | 153.9 | 31.9 | 185.8 |
| February | 135.9 | 11.4 | 161.5 | 120.0 | 428.8 | 153.0 | 32.7 | 185.7 |
| March | 132.3 | 11.3 | 160.6 | 121.8 | 426.0 | 152.7 | 32.8 | 185.5 |
| April | 132.7 | 10.8 | 160.5 | 122.7 | 426.7 | 152.8 | 33.3 | 186.1 |
| May | 130.7 | 11.0 | 160.4 | 124.5 | 426.6 | 152.2 | 35.0 | 187.2 |
| June | 132.1 | 11.2 | 164.6 | 130.6 | 438.5 | 153.4 | 36.4 | 189.8 |
| July | 131.6 | 11.3 | 165.1 | 132.2 | 440.2 | 153.1 | 36.6 | 189.7 |
| August | 131.5 | 11.3 | 165.0 | 132.3 | 440.1 | 152.9 | 36.7 | 189.6 |
| September | 132.8 | 11.2 | 162.4 | 129.4 | 435.8 | 151.8 | 36.6 | 188.4 |
| October | 133.6 | 11.1 | 159.6 | 128.4 | 432.7 | 151.3 | 35.6 | 186.9 |
| November | 134.0 | 11.2 | 159.1 | 130.3 | 434.6 | 149.2 | 34.8 | 184.0 |
| December | 134.7 | 11.0 | 158.2 | 129.1 | 433.0 | 149.0 | 32.7 | 181.7 |
| Average, 1964 | 133.3 | 11.1 | 161.5 | 127.1 | 433.0 | 152.1 | 34.6 | 186.7 |

[1] Standard Industrial Classification Industry 295, paving and roofing materials included in total.

Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings Statistics 1909–64, Bull. 1312–2, December 1964, and monthly reports December 1964 through March 1965.

**TABLE 23.—Comparison of data on total employment in the mineral energy resources industries**

(Thousands)

| Year | Petroleum | | Bituminous coal | | | Anthracite | | |
|---|---|---|---|---|---|---|---|---|
| | BLS [1] | BES [2] | BLS | BES | Bureau of Mines | BLS | BES | Bureau of Mines |
| 1960 | 309.2 | 299.6 | 168.5 | 163.2 | 169.4 | 17.6 | 14.9 | 19.1 |
| 1961 | 303.1 | 294.1 | 147.1 | 145.6 | 150.5 | 14.2 | 12.8 | 15.8 |
| 1962 | 298.0 | 289.1 | 140.0 | 138.8 | 143.8 | 11.9 | 11.6 | 14.0 |
| 1963 | 289.1 | 280.2 | 136.9 | 135.5 | 141.6 | r 11.2 | 11.2 | 13.5 |
| 1964 | 280.8 | 282.0 | 133.3 | 132.3 | 128.7 | 11.1 | 11.4 | 13.1 |

r Revised.
[1] BLS: Bureau of Labor Statistics.
[2] BES: Bureau of Employment Security.

Source: BLS data from U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings for the United States, 1909–64 and Employment and Earnings, March 1965, table B–2. BES data from the Bureau of Employment Security.

**TABLE 24.—Index of labor output**

(1957–59=100)

| Year | Petroleum refining | | | Bituminous coal and lignite mining | | |
|---|---|---|---|---|---|---|
| | Employee | Production worker | Production worker man-hour | Employee | Production worker | Production worker man-hour |
| 1959 | 109.5 | 109.6 | r 109.7 | 105.6 | 107.8 | r 106.3 |
| 1960 | r 113.0 | 115.2 | r 114.1 | 112.8 | 116.3 | r 114.2 |
| 1961 | r 120.2 | 122.8 | r 122.0 | 125.3 | 129.9 | r 127.2 |
| 1962 r | 129.7 | 133.5 | 132.4 | 137.7 | 142.8 | 135.8 |
| 1963 | 136.7 | 140.0 | 139.6 | 153.2 | 158.5 | 143.4 |

r Revised.

Source: U.S. Department of Labor, Bureau of Labor Statistics. Indexes of Output per Man-hour for Selected Industries (forthcoming).

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TABLE 25.—Average hours and gross earnings of production workers in the mineral energy resources and related industries

| Year and month | Mining | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total fuels [1] | | | Total coal mining | | | Bituminous coal | | | Crude petroleum and natural gas | | |
| | Weekly earnings | Weekly hours | Hourly earnings | Weekly earnings | Weekly hours | Hourly earnings | Weekly earnings | Weekly hours | Hourly earnings | Weekly earnings | Weekly hours | Hourly earnings |
| 1960 | $105.99 | 39.6 | $2.70 | $110.41 | 35.5 | $3.11 | $112.41 | 35.8 | $3.14 | $103.32 | 42.0 | $2.46 |
| 1961 | 107.44 | 39.7 | 2.72 | 110.62 | 35.8 | 3.09 | 112.01 | 35.9 | 3.12 | 105.75 | 41.8 | 2.53 |
| 1962 | 110.50 | 40.3 | 2.77 | 113.06 | [2] 36.9 | [2] 3.09 | 114.46 | [2] 37.0 | [2] 3.12 | 109.20 | 42.0 | 2.60 |
| 1963 | 114.98 | 41.0 | 2.82 | 119.98 | [2] 38.8 | [2] 3.12 | 121.43 | [2] 38.9 | [2] 3.15 | 112.41 | 42.1 | 2.67 |
| 1964: | | | | | | | | | | | | |
| January | 117.01 | 41.0 | 2.86 | 125.29 | 39.4 | 3.18 | 127.12 | 39.6 | 3.21 | 112.71 | 41.9 | 2.69 |
| February | 116.02 | 40.9 | 2.85 | 121.09 | 38.2 | 3.17 | 123.52 | 38.6 | 3.20 | 113.36 | 42.3 | 2.68 |
| March | 113.86 | 40.5 | 2.83 | 115.97 | 36.7 | 3.16 | 117.76 | 36.8 | 3.20 | 112.78 | 42.4 | 2.66 |
| April | 115.01 | 40.6 | 2.85 | 121.82 | 37.6 | 3.24 | 123.33 | 37.6 | 3.28 | 111.57 | 42.1 | 2.65 |
| May | 116.91 | 40.9 | 2.87 | 126.49 | 38.8 | 3.26 | 129.03 | 39.1 | 3.30 | 112.14 | 42.0 | 2.67 |
| June | 117.51 | 41.4 | 2.85 | 131.86 | 40.2 | 3.28 | 134.53 | 40.4 | 3.33 | 110.62 | 41.9 | 2.64 |
| July | 116.13 | NA | NA | 121.32 | NA | NA | 122.84 | NA | NA | 113.63 | 42.4 | 2.68 |
| August | 118.38 | 41.0 | 2.89 | 131.01 | 39.7 | 3.30 | 133.27 | 39.9 | 3.34 | 112.32 | 41.6 | 2.70 |
| September | 117.18 | 40.3 | 2.90 | 124.50 | 37.5 | 3.32 | 126.67 | 37.5 | 3.36 | 113.57 | 41.6 | 2.73 |
| October | 121.95 | 41.6 | 2.94 | 133.72 | 40.4 | 3.31 | 136.35 | 40.7 | 3.35 | 116.05 | 42.2 | 2.75 |
| November | 121.89 | 41.3 | 2.96 | 134.34 | 40.1 | 3.35 | 136.62 | 40.3 | 3.39 | 115.64 | 41.9 | 2.76 |
| December | 121.48 | 41.4 | 2.94 | 135.20 | 40.6 | 3.33 | 138.17 | 41.0 | 3.37 | 114.53 | 41.8 | 2.74 |
| 1964 average | 117.89 | 41.0 | 2.89 | 126.88 | [2] 39.0 | [2] 3.26 | 129.10 | [2] 39.2 | [2] 3.30 | 113.40 | 42.0 | 2.70 |

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| | Manufacturing | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Petroleum refining and related industries | | | Petroleum refining | | | Other petroleum and coal products | | |
| | Weekly earnings | Weekly hours | Hourly earnings | Weekly earnings | Weekly hours | Hourly earnings | Weekly earnings | Weekly hours | Hourly earnings |
| 1960 | 118.78 | 41.1 | 2.89 | 128.22 | 40.8 | 3.02 | 98.3 | 42.6 | 2.32 |
| 1961 | 124.31 | 41.3 | 3.01 | 129.24 | 40.9 | 3.16 | 102.10 | 42.9 | 2.38 |
| 1962 | 126.88 | 41.6 | 3.05 | 131.43 | 41.2 | 3.19 | 107.75 | 43.1 | 2.50 |
| 1963 | 131.77 | 41.7 | 3.16 | 137.45 | 41.4 | 3.32 | 108.28 | 42.8 | 2.53 |
| 1964: | | | | | | | | | |
| January | 132.16 | 41.3 | 3.20 | 138.69 | 41.4 | 3.35 | 102.82 | 40.8 | 2.52 |
| February | 131.65 | 41.4 | 3.18 | 137.94 | 41.3 | 3.34 | 105.34 | 41.8 | 2.52 |
| March | 131.24 | 41.4 | 3.17 | 137.20 | 41.2 | 3.33 | 107.02 | 42.3 | 2.53 |
| April | 130.92 | 41.3 | 3.17 | 136.20 | 40.9 | 3.33 | 108.71 | 42.8 | 2.54 |
| May | 133.14 | 42.0 | 3.17 | 137.94 | 41.3 | 3.34 | 114.62 | 44.6 | 2.57 |
| June | 133.46 | 42.1 | 3.17 | 138.02 | 41.2 | 3.35 | 116.87 | 45.3 | 2.58 |
| July | 134.09 | 42.3 | 3.17 | 138.69 | 41.4 | 3.35 | 117.39 | 45.5 | 2.58 |
| August | 133.88 | 42.1 | 3.18 | 138.77 | 41.3 | 3.36 | 116.10 | 45.0 | 2.58 |
| September | 140.51 | 43.1 | 3.26 | 146.53 | 42.5 | 3.45 | 118.88 | 45.2 | 2.63 |
| October | 133.86 | 41.7 | 3.21 | 138.24 | 41.7 | 3.38 | 117.48 | 44.5 | 2.64 |
| November | 134.69 | 41.7 | 3.23 | 141.52 | 41.7 | 3.41 | 109.98 | 41.5 | 2.60 |
| December | 135.53 | 41.7 | 3.25 | 141.86 | 41.6 | 3.25 | 109.46 | 42.1 | 2.60 |
| 1964 average | 133.76 | 41.8 | 3.20 | 139.52 | 41.4 | 3.37 | 112.49 | 43.6 | 2.58 |

NA Not available.
[1] Weighted average using employment as weight computed by author.
[2] 11-month average.

Source: U.S. Department of Labor, Bureau of Labor Statistics. Employment and Earnings for the United States, 1909–64, Bull. 1312-2, December 1964, and monthly issues December 1964 through March 1965.

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**Labor-Turnover Rates.**—Labor-turnover rates, shown in table 26 did not fluctuate greatly from 1963 except for coal mining in which all rates declined. Separations slightly exceeded accessions. Conditions in the coal mining industry indicated that the skills of the accessions are usually higher than those of the separations.

**TABLE 26.—Average labor turnover rates, mineral energy resources and related industries**

(Per thousand employees)

| Rates, year | All manufacturing | Petroleum refining and related industries [1] | Petroleum refining | Coal mining |
|---|---|---|---|---|
| Total accession rate: | | | | |
| 1963 | 39 | 15 | 10 | 20 |
| 1964 | 40 | 16 | 11 | 17 |
| Total separation rate: | | | | |
| 1963 | 39 | 20 | 14 | 21 |
| 1964 | 39 | 18 | 13 | 18 |
| Layoff rate: | | | | |
| 1963 | 18 | 7 | 3 | 12 |
| 1964 | 17 | 7 | 4 | 9 |

[1] Standard Industrial Classification Industry 295, paving and roofing materials included in total.

Source: U.S. Department of Commerce, Bureau of Labor Statistics. Employment and Earnings Statistics for the United States 1909–64, Bull. 1312-2, December 1964 and monthly issues December 1964 through March 1965.

## PRICES AND COSTS

**Value.**—The 1964 index of average unit mine value for mineral-energy resources, shown in table 27, declined slightly as a result of lower prices paid producers of crude oil and natural gas. This index shows changes in the return to producers of crude minerals at the point of production. Table 28, the index of implicit unit value, is a measure of relative rather than absolute prices and is designed to represent the real price changes of mineral commodities. It is derived by dividing the index of physical volume into an index of value.

**Prices.**—The wholesale price index for the fuels related products, and power, shown in table 29, decreased 2.7 percent in 1964. Anthracite and coke were the only items in the group to increase but these increases were more than offset by a 4.7 percent decrease in refined petroleum products, a series more heavily weighted in the index than anthracite and coke combined. Comparative fuels prices are shown in table 30.

**Fuel Costs, Electricity Generation.**—Although the price of coal increased, the cost of fuels consumed in steam electric power generation shown in table 31 decreased for all fuels. This was largely due to increased efficiency of coal utilization in power generation. The differential in regional prices indicates the significance of transportation cost in these industries.

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**TABLE 27.—Index of average unit mine value of minerals produced in the United States, by group and subgroup [1]**

(1957–59=100)

| Year | All minerals | Metals total | Nonmetals total | Mineral energy resources | | |
|---|---|---|---|---|---|---|
| | | | | Total | Coal | Crude oil and natural gas |
| 1960 | 98 | 105 | 102 | 96 | 95 | 98 |
| 1961 | 98 | 103 | 102 | 97 | 93 | 99 |
| 1962 | 98 | 102 | 102 | 97 | 91 | 100 |
| 1963 | 98 | 106 | 102 | 96 | 90 | 99 |
| 1964 | 99 | 118 | 103 | 95 | 91 | 98 |

[1] For description of index, see "Review of Minerals Industries" chapter in Minerals Yearbook, v. 1, 1959, pp. 22–24.

**TABLE 28.—Index of implicit unit value of minerals produced in the United States, by group and selected subgroup [1]**

(1957–59=100)

| Year | All minerals | Mineral energy resources | | | Metals total | Nonmetals total |
|---|---|---|---|---|---|---|
| | | Total | Coal | Crude oil and natural gas | | |
| 1960 | 100.9 | 99.3 | 94.9 | 100.0 | 106.8 | 100.7 |
| 1961 | 101.1 | 100.5 | 93.0 | 101.3 | 102.8 | 100.4 |
| 1962 | r 101.6 | r 101.3 | 91.0 | 102.9 | r 103.6 | r 99.7 |
| 1963 | r 101.4 | r 100.8 | r 89.6 | r 103.1 | r 105.9 | r 98.9 |
| 1964 | 102.4 | 100.9 | 89.1 | 103.4 | 112.7 | 99.8 |

r Revised.
[1] The entire index has been revised from 1960 to present.

**TABLE 29.—Average monthly wholesale price indexes for selected mineral energy resources**

(1957–59=100, unless otherwise specified)

| Year and month | Wholesale price index, all commodities | Fuels and related products, and power | Coal | Anthracite | Coke | Gas fuels [1] | Electric power [1] | Crude petroleum [2] | Petroleum products refined |
|---|---|---|---|---|---|---|---|---|---|
| 1960 | 100.7 | 99.6 | 98.8 | 99.9 | 103.6 | 116.6 | 101.9 | 97.2 | 97.6 |
| 1961 | 100.3 | 100.7 | 97.7 | 95.7 | 103.6 | 118.6 | 102.4 | 97.5 | 99.3 |
| 1962 | 100.6 | 100.2 | 96.8 | 94.2 | 103.6 | 119.2 | 102.8 | 97.7 | 98.2 |
| 1963 | 100.3 | 99.8 | 96.9 | 96.0 | 103.6 | 122.8 | 102.0 | 97.3 | 97.2 |
| 1964 | 100.5 | 97.1 | 96.9 | 98.2 | 106.3 | 121.3 | 101.1 | 96.9 | 92.7 |
| January | 101.0 | 99.5 | 98.3 | 102.0 | 103.6 | 124.8 | 101.3 | 97.2 | 96.6 |
| February | 100.5 | 99.0 | 98.1 | 102.0 | 103.6 | 126.8 | 101.3 | 97.2 | 95.3 |
| March | 100.4 | 97.0 | 97.1 | 102.0 | 103.6 | 123.2 | 99.4 | 97.2 | 92.9 |
| April | 100.3 | 96.1 | 95.0 | 93.9 | 106.1 | 120.4 | 101.3 | 97.2 | 91.1 |
| May | 100.1 | 96.4 | 95.1 | 93.9 | 107.3 | 116.6 | 101.3 | 97.2 | 92.2 |
| June | 100.0 | 96.3 | 95.3 | 93.9 | 107.3 | 116.0 | 100.9 | 96.8 | 92.3 |
| July | 100.4 | 96.7 | 96.1 | 97.1 | 107.3 | 120.2 | 100.6 | 96.8 | 92.5 |
| August | 100.3 | 96.4 | 96.6 | 97.1 | 107.3 | 121.2 | 101.4 | 96.7 | 91.4 |
| September | 100.7 | 96.2 | 97.3 | 97.1 | 107.3 | 118.4 | 101.5 | 96.7 | 89.5 |
| October | 100.8 | 96.7 | 97.7 | 99.8 | 107.3 | 120.4 | 101.5 | 96.7 | 91.9 |
| November | 100.7 | 97.6 | 98.0 | 99.8 | 107.3 | 123.1 | 101.4 | 96.7 | 93.3 |
| December | 100.7 | 98.1 | 98.2 | 99.8 | 107.3 | 124.0 | 101.3 | 96.7 | 94.0 |

[1] January 1958=100.
[2] Not included in the group, "Fuels and related products, and power."

Source: U.S. Department of Labor, Bureau of Labor Statistics. Monthly Labor Review, v. 87, No. 3, March 1965, p. 372. Wholesale Prices and Price Indexes, monthly issues from February through December 1964.



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## TABLE 30.—Comparative mineral energy resource prices

| Fuel | | 1963 | 1964 |
|---|---|---|---|
| Bituminous coal: | | | |
| Average prices: | | | |
| Average retail price | dollars per net ton | r 17.46 | (1) |
| Costs of coal at merchant coke ovens | do | 9.35 | 9.85 |
| Anthracite, average sales realization per net ton at preparation plants, excluding dredge coal: | | | |
| Chestnut | dollars | 12.24 | 12.92 |
| Pea | do | 10.15 | 10.82 |
| Buckwheat No. 1 | do | 9.06 | 9.69 |
| Petroleum and petroleum products: | | | |
| Crude petroleum, average price per barrel at well | do | 2.89 | 2.88 |
| Gasoline, average dealers net price (excluding taxes) of gasoline in 55 U.S. cities [2] | cents per gallon | 15.22 | 14.82 |
| Residual fuel oil: | | | |
| No. 6 fuel, average of high and low prices in Philadelphia [2] | dollars per barrel (refinery) | 3.05 | 3.05 |
| Bunker C, average price for all Gulf ports [2] | do | 2.12 | 2.10 |
| Distillate fuel oil: | | | |
| No. 2 distillate, average of high and low prices at Philadelphia [2] | cents per gallon (refinery) | 9.80 | 9.24 |
| No. 2 distillate, average price for all Gulf ports [2] | do | 8.76 | 8.13 |
| Natural gas: | | | |
| Average U.S. value at well | cents per thousand cubic feet | 15.8 | 15.4 |
| Average U.S. value at point of consumption | do | 51.2 | 51.6 |

r Revised.
[1] Series discontinued.
[2] Platt's Oil Price Handbook.

## TABLE 31.—Cost of fuel in steam-electrical power generation, United States

(Cents per million Btu)

| Region | Coal | Oil | Gas | Coal | Oil | Gas | Coal | Oil | Gas |
|---|---|---|---|---|---|---|---|---|---|
| | 1958 | | | 1959 | | | 1960 | | |
| New England | 40.1 | 40.7 | 37.8 | 37.7 | 35.8 | 34.5 | 36.5 | 36.0 | 35.6 |
| Middle Atlantic | 32.3 | 38.5 | 32.0 | 30.8 | 35.5 | 33.0 | 30.0 | 35.1 | 35.7 |
| East North Central | 25.8 | 68.5 | 24.6 | 25.6 | 73.2 | [1]24.5 | 25.3 | 65.5 | [1]25.3 |
| West North Central | 28.1 | 51.3 | 22.0 | 27.5 | 46.7 | 22.4 | 27.0 | 43.4 | 23.0 |
| South Atlantic | 28.6 | 30.7 | 27.6 | 27.2 | 35.5 | 29.7 | 26.3 | 35.6 | 31.8 |
| East South Central | 19.4 | 37.6 | 21.6 | 19.1 | 47.1 | 23.4 | 19.6 | 50.3 | 24.8 |
| West South Central | 15.6 | 41.8 | 12.9 | 15.8 | 43.2 | 15.0 | 32.3 | 45.1 | 16.7 |
| Mountain | 21.9 | 25.2 | 22.2 | 21.3 | 24.3 | 25.7 | 20.2 | 25.0 | 27.8 |
| Pacific | ------- | 42.0 | 26.5 | ------- | 34.8 | 32.0 | ------- | 32.3 | 33.4 |
| Average | 27.4 | 39.6 | 19.5 | 26.5 | 35.2 | 22.3 | 26.0 | 34.5 | 23.8 |
| | 1961 | | | 1962 | | | 1963 | | |
| New England | 36.2 | 37.7 | 36.3 | 35.5 | 36.1 | 35.1 | 34.1 | 34.7 | 34.6 |
| Middle Atlanticgg | 29.9 | 36.2 | 37.7 | 29.0 | 34.2 | 37.2 | 27.2 | 32.1 | 33.3 |
| East North Central | 25.0 | 64.7 | 26.4 | 24.9 | 70.5 | 25.7 | 24.8 | 69.8 | 24.9 |
| West North Central | 26.2 | 47.4 | 22.8 | 26.6 | 49.7 | 23.8 | 26.4 | 50.1 | 23.8 |
| South Atlantic | 25.8 | 35.2 | 32.5 | 25.6 | 34.6 | 32.3 | 25.5 | 34.4 | 32.6 |
| East South Central | 19.7 | 50.9 | 25.4 | 19.3 | 48.9 | 25.4 | 20.0 | 47.5 | 24.5 |
| West South Central | ------- | 43.8 | 19.0 | ------- | 42.2 | 19.5 | 16.6 | 38.3 | 19.4 |
| Mountain | 19.6 | 25.6 | 28.5 | 22.7 | 25.1 | 29.0 | 20.4 | 27.4 | 27.7 |
| Pacific | ------- | 32.6 | 35.2 | ------- | 33.6 | 34.8 | ------- | 33.0 | 36.1 |
| Average | 25.8 | 35.5 | 25.1 | 25.6 | 34.5 | 26.4 | 25.0 | 33.5 | 25.9 |

[1] Excludes blast-furnace gas, which would lower cost slightly.

Source: National Coal Association. Steam-Electric Plant Factors. Annually, 1958 through 1963.

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**Electricity Costs.**—The cost of electricity by region and principal rate class is shown in table 32. Comparisons of regional rates are often useful when making decisions concerning plant location or the use of alternative energy sources.

The index of major input expenses (table 33) indicates changes in operating cost and does not reflect the actual cost of producing these fuels as capital costs are omitted. The constant decline of input expenses for bituminous coal has occurred during a period of increasing wages. However, the wage increases were more than offset by productivity advances, thus reducing unit labor cost.

**Relative Labor Cost.**—The indexes of relative labor cost (table 34) further illustrate productivity gains realized in the bituminous coal industry.

**Machinery Prices.**—Table 35 shows wholesale price indexes of selected machinery and equipment used in the mineral-energy resource industry. All indexes show increases for 1964.

**TABLE 32.—Cost of electrical energy per kilowatt-hour**

(Cents)

| Region | 1958 | | | 1959 | | | 1960 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Residential [1] | Commercial and industrial | Total | Residential [1] | Commercial and industrial | Total | Residential [1] | Commercial and industrial |
| New England | 2.6 | 3.3 | 2.2 | 2.6 | 3.2 | 2.1 | 2.5 | 3.2 | 2.1 |
| Middle Atlantic | 2.1 | 3.0 | 1.7 | 2.1 | 3.0 | 1.7 | 2.0 | 2.9 | 1.7 |
| East North Central | 1.7 | 2.6 | 1.4 | 1.7 | 2.6 | 1.4 | 1.7 | 2.7 | 1.4 |
| West North Central | 2.4 | 3.0 | 1.9 | 2.3 | 2.9 | 1.9 | 2.2 | 2.8 | 1.8 |
| South Atlantic | 1.8 | 2.5 | 1.5 | 1.8 | 2.4 | 1.5 | 1.8 | 2.4 | 1.5 |
| East South Central | .8 | 1.6 | .6 | .8 | 1.6 | .6 | .8 | 1.5 | .7 |
| West South Central | 1.8 | 2.8 | 1.4 | 1.8 | 2.8 | 1.4 | 1.8 | 2.7 | 1.4 |
| Mountain | 1.6 | 2.3 | 1.2 | 1.6 | 2.3 | 1.3 | 1.5 | 2.3 | 1.2 |
| Pacific | 1.4 | 1.9 | 1.1 | 1.4 | 1.8 | 1.1 | 1.4 | 1.8 | 1.1 |
| Total | 1.7 | 2.5 | 1.3 | 1.7 | 2.5 | 1.3 | 1.7 | 2.4 | 1.3 |
| | 1961 [2] | | | 1962 | | | 1963 | | |
| New England | 2.5 | 3.1 | 2.1 | 2.5 | 3.1 | 2.1 | 2.5 | 3.1 | 2.1 |
| Middle Atlantic | 2.0 | 2.9 | 1.7 | 2.0 | 2.9 | 1.6 | 2.0 | 2.8 | 1.6 |
| East North Central | 1.7 | 2.6 | 1.4 | 1.7 | 2.6 | 1.4 | 1.7 | 2.6 | 1.4 |
| West North Central | 2.2 | 2.8 | 1.5 | 2.2 | 2.7 | 1.8 | 2.2 | 2.7 | 1.8 |
| South Atlantic | 1.8 | 2.3 | 1.5 | 1.7 | 2.3 | 1.4 | 1.7 | 2.2 | 1.4 |
| East South Central | .9 | 1.5 | .7 | .9 | 1.5 | .7 | .9 | 1.4 | .7 |
| West South Central | 1.8 | 2.7 | 1.5 | 1.8 | 2.6 | 1.4 | 1.7 | 2.5 | 1.4 |
| Mountain | 1.5 | 2.4 | 1.2 | 1.5 | 2.3 | 1.2 | 1.5 | 2.3 | 1.3 |
| Pacific | 1.4 | 1.9 | 1.1 | 1.4 | 1.9 | 1.1 | 1.3 | 1.8 | 1.1 |
| Total [3] | 1.7 | 2.4 | 1.4 | 1.7 | 2.4 | 1.4 | 1.6 | 2.4 | 1.3 |

[1] Includes rural.
[2] Beginning with 1961 rural included in all 3 classes.
[3] Includes Alaska and Hawaii for 1960–63.

Source: Edison Electric Institute, Statistical Year Book of the Electric Utility Industry, 1958–63.

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**TABLE 33.—Index of major input expenses for bituminous coal and crude petroleum and natural gas mining [1]**

(1957–59=100)

| Year | Bituminous coal | Crude petroleum and natural gas | Year | Bituminous coal | Crude petroleum and natural gas |
|---|---|---|---|---|---|
| 1960 | 96 | 100 | 1963 | r 86 | 99 |
| 1961 | 91 | 100 | 1964 | 84 | 99 |
| 1962 | 88 | 99 | | | |

r Revised.
[1] Index constructed by author using weights derived from 1958 Census of Mineral Industries and using data from U.S. Department of Labor, Bureau of Labor Statistics, Wholesale Price Index, annual and monthly releases.

**TABLE 34.—Indexes of relative labor cost, bituminous coal and petroleum mining**

(1957–59=100)

| Year | Index of labor costs per unit of output [1] | | Index of value of product per man-period [2] | | Index of labor costs per dollar of product [3] | |
|---|---|---|---|---|---|---|
| | Bituminous coal | Petroleum | Bituminous coal | Petroleum | Bituminous coal | Petroleum |
| 1960 | 94 | 100 | 108 | 103 | 98 | 103 |
| 1961 | 86 | 100 | 114 | 108 | 92 | 103 |
| 1962 | 82 | 98 | 118 | 114 | 89 | 102 |
| 1963 | 79 | 98 | 120 | 119 | 88 | 101 |
| 1964 | 75 | 98 | 132 | 121 | 84 | 102 |

[1] Bituminous index based upon net tons per man per day (see "Coal" chapter, this volume) and index of average earnings derived from Bureau of Labor Statistics data on hourly earnings; petroleum index based on barrels per year (see "Petroleum" section, this volume) and Bureau of Employment Security data on total wages in petroleum production.
[2] Bituminous index based on net tons per man per day and mine values of production; petroleum index based on average employment and total value of production.
[3] Bituminous index based on index of value per man per day and index of average earnings; petroleum index based on total value of production and total wages.

**TABLE 35.—Wholesale price indexes of selected machinery and equipment items**

(1957–59=100)

| Year | Oilfield machinery and tools | Mining machinery and equipment | Power cranes, draglines, shovels, etc. | Construction machinery and equipment | Specialized construction machinery |
|---|---|---|---|---|---|
| 1960 | 100.3 | 106.4 | 105.1 | 105.8 | 106.9 |
| 1961 | 101.8 | 107.8 | 105.4 | 107.5 | 107.8 |
| 1962 | 103.2 | 108.4 | 106.1 | 107.8 | 107.4 |
| 1963 | 102.6 | 109.1 | 108.8 | 109.6 | 108.1 |
| 1964 | 104.4 | 110.8 | 111.8 | 112.4 | 108.5 |
| | Portable air compressors | Scrapers and graders | Contractor's air tools, handheld | Mixers, pavers, spreaders, etc. | Tractors other than farm |
| 1960 | 105.4 | 104.7 | 108.2 | 106.7 | 106.4 |
| 1961 | 114.1 | 104.4 | 113.5 | 108.4 | 108.0 |
| 1962 | 113.7 | 105.3 | 113.5 | 110.3 | 108.5 |
| 1963 | 115.1 | 108.5 | 113.5 | 112.1 | 110.8 |
| 1964 | 117.6 | 110.8 | (1) | 116.3 | 114.7 |

[1] Series discontinued January 1964.

Source: Bureau of Labor Statistics, 1962 Statistical Supplement, Monthly Labor Review, p. 79, and Wholesale Prices and Price Indexes, January 1965.

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## INCOME AND INVESTMENT

National income for selected mineral industries, including wages and salaries paid and profits generated in these industries, is shown in table 36. During 1964, income increased in all major mining industries including the energy resource industries. However, the rate of increase in income from crude petroleum and natural gas expanded at a slower rate than in 1963. Petroleum refining and related industries in the manufacturing sector also showed considerably less growth in income than in the previous year. National income generated in the mining industry expanded at a slower rate than income for all industries in 1964.

Current expenditures in new plant and equipment by selected industries are shown in table 37. Expenditures for mining increased 14.4 percent. In manufacturing, expenditures in the petroleum and coal component increased 15 percent. This was somewhat lower than expenditures in primary iron and steel which increased 36 percent with chemicals, up 22 percent. Decisions to invest in new plant and equipment in the energy resource industries reflect the continuing decline in excess capacity in many of these industries, the growth of technology, and the expansion of the economy.

**TABLE 36.—National income by industrial origin in selected industries**

| Industry | 1962 (millions) | 1963 (millions) | Change from 1962 (percent) | 1964 (millions) | Change from 1963 (percent) |
|---|---|---|---|---|---|
| All industries | $457,687 | $481,110 | +5.1 | $514,389 | +6.9 |
| Mining | 5,653 | 5,971 | +5.6 | 6,233 | +4.4 |
| Metal mining | 758 | 807 | +6.5 | 882 | +9.3 |
| Coal mining | 1,141 | 1,211 | +6.1 | 1,274 | +5.2 |
| Crude petroleum and natural gas | 2,811 | 2,928 | +4.2 | 2,981 | +1.8 |
| Nonmetallic mining and quarrying | 943 | 1,025 | +8.7 | 1,096 | +6.9 |
| Manufacturing | 136,988 | 143,817 | +5.0 | 154,662 | +7.5 |
| Petroleum refining and related industries | 4,489 | 4,805 | +7.0 | 4,814 | +0.2 |

Source: U.S. Department of Commerce, Office of Business Economics, Survey of Current Business, August 1965.

**TABLE 37.—Expenditures on new plant and equipment by firms in mining and selected mineral manufacturing industries**

(Billion dollars)

| | 1962 | 1963 | 1964 |
|---|---|---|---|
| Mining [1] | 1.08 | 1.04 | 1.19 |
| Selected manufacturing: | | | |
| Primary iron and steel | 1.10 | 1.24 | 1.69 |
| Primary nonferrous metals | .31 | .41 | .48 |
| Stone, clay, and glass products | .58 | .61 | .68 |
| Chemical and allied products | 1.56 | 1.61 | 1.97 |
| Petroleum and coal products | 2.88 | 2.92 | 3.36 |
| All manufacturing | 14.68 | 15.69 | 18.58 |

[1] Including fuels.

Source: U.S. Department of Commerce, Office of Business Economics, Survey of Current Business, March 1964, p. 13, and June 1965, p. 6.

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Direct private investment by U.S. companies in foreign petroleum industries, remained the largest portion of total U.S. foreign investment and continued to increase in 1964. As shown in table 38, the book value of private U.S. foreign investment in petroleum industry at the end of 1964 was $14.4 billion and about one-third of total direct investment by private U.S. sources in foreign industries. An important factor in the increase in U.S. petroleum investment abroad was the continuing reinvestment abroad of undistributed profits of U.S. subsidiaries and the rising market value of foreign securities held.

Total direct foreign investment in the United States in 1964 and the value of the petroleum component is shown in table 39. Petroleum is the only mineral energy resource in which there is substantial foreign investment in the United States. During the year petroleum accounted for 19 percent of the total of such investment.

**TABLE 38.—Direct private investment of U.S. companies in foreign petroleum industries**

(Million dollars; net inflows to the United States (−))

| | Petroleum | | | | All industries | | | |
|---|---|---|---|---|---|---|---|---|
| | Book value beginning of year | Net capital outflows | Undistributed earnings of subsidiaries | Book value end of year | Book value beginning of year | Net capital outflows | Undistributed earnings of subsidiaries | Book value end of year |
| Canada | 3,134 | 30 | 54 | 3,228 | 13,044 | 250 | 498 | 13,820 |
| Latin American Republics, all | 3,095 | 4 | 3 | 3,142 | 8,662 | 156 | 219 | 9,085 |
| Other Western Hemisphere | 541 | 31 | −1 | 569 | 1,229 | 134 | 34 | 1,386 |
| Europe | 2,776 | 389 | −87 | 3,086 | 10,340 | 1,342 | 410 | 12,067 |
| Africa | 702 | 97 | 4 | 830 | 1,426 | 135 | 40 | 1,629 |
| Middle East | 1,206 | 25 | 8 | 1,238 | 1,277 | 42 | 11 | 1,331 |
| Far East | 714 | 74 | −20 | 775 | 1,515 | 146 | 47 | 1,731 |
| Oceania | 496 | 30 | −1 | 444 | 1,460 | 115 | 80 | 1,582 |
| International | 968 | 60 | −9 | 1,038 | 1,733 | 56 | 79 | 1,865 |
| Total | 13,652 | [1] 739 | −49 | 14,350 | 40,686 | 2,376 | [1] 1,417 | 44,496 |

[1] Total does not add due to rounding.

Source: U.S. Department of Commerce, Office of Business Economics. Survey of Current Business, September 1965.

**TABLE 39.—Value of foreign direct investments in the United States**

(Millions of dollars)

| Industry | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Total | 6,910 | 7,392 | 7,612 | 7,944 | 8,363 |
| Petroleum | 1,238 | 1,325 | 1,419 | 1,513 | 1,612 |

Source: U.S. Department of Commerce, Office of Business Economics. Survey of Current Business, September 1965.

## GOVERNMENT ACTIVITIES

Several established programs of the Bureau of Mines were related to conservation and development of mineral energy resources and related products. The central objective of these programs is to provide an adequate supply of energy resources for the maintenance of U.S. affluence and industrial power, to assure continued prosperity

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and economic growth, and to meet the requirements of national security. One of the principal Bureau activities is continuous analysis and evaluation of total energy economy and its components. The Bureau of Mines periodically publishes studies and reports showing energy balances at the national level and supply and demand relationships of energy resources by source and end-use sectors. Accelerated energy consumption has intensified the need to maintain an adequate energy base for the economy and to provide adequate supplies of energy at constant or lower costs to meet the evolving needs of the energy consuming markets. With the objective of effecting further efficiencies in the energy economy, the Bureau periodically conducts energy resource investigations which include development of fundamental engineering and economic data, surveys of mining operations, and market research and analysis. The Bureau also appraises and analyzes the cost and price structures of the energy industries and makes projections of the future United States demand for total energy and its components. In the international area, the Bureau provides a constant flow of information on foreign energy resources and industries including international trade. During 1964 mineral energy resource studies were prepared about various phases of the United States coal, natural gas and petroleum industries, their markets and trade.

Energy problems, including those encountered and evaluated under the mineral resource development program, are frequently the subject of investigation and analysis under the Bureau program for minerals research. This program encompasses virtually all of the major minerals including sources of energy. The central objective of the minerals research program is to assist in development and conservation of national resources through the advance of science and technology. The program is directed toward avoidance of waste in energy resource industries, stimulation of productivity, savings in production costs, and introduction of new materials and processes. Bureau scientists and engineers are particularly concerned with advancement of new concepts for extraction and use of petroleum, natural gas, shale oil, and coal, as well as new discovery, secondary recovery, and expansion of reserves of these resources.

Recent profitable research contributions in the field of energy resources include Bureau of Mines findings which led to the planning of a secondary oil recovery program for the Utah Oil and Gas Commission that is expected to yield 100 million barrels of additional oil for a 25-year period in the greater Aneth field. Pressure maintenance processes advanced by the Bureau are widely applied and these are expected to produce significant additional quantities of oil from reservoirs. Data from Bureau research on gas compressibility, vapor-liquid equilibria, and other properties of gas and reservoir liquids are contributing to increased recovery of gas from high-pressure fields. An offshoot of Bureau research on liquid fuels from coal was development of the Oxo process for economic production of industrial alcohols widely used in detergents and plastics. The Bureau is also working to further new concepts of energy transfer such as the coal-fired turbine, magnetohydrodynamics, and the economic production of shale oil from oil shale. Through these and other mineral resource development and research activities, the Bureau makes a continuing

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contribution to the needs of Government, industry, and the general public.

National expenditures for research and development activities in selected industries are shown in table 40. Whereas research and development for chemicals and allied products remained the major area for such expenditures in 1963, expenditures for petroleum and refining were significant, accounting for 2.2 percent of industrial funds in 1963. With both chemical and petroleum, private funds were considerably in excess of Federal funds expended during the year. For all industries, however, Federal expenditures considerably exceeded private.

**TABLE 40.—Research and development activity**

| | Funds expended (million dollars) | | | | | |
|---|---|---|---|---|---|---|
| | Total | | Company | | Federal | |
| | 1962 | 1963 | 1962 | 1963 | 1962 | 1963 |
| Petroleum refining and extraction | 305 | 315 | 285 | 295 | 20 | 20 |
| Percent of all industries | 2.6 | 2.3 | 5.7 | 5.5 | 0.3 | 0.2 |
| Chemicals and allied products | 1,184 | 1,253 | 924 | 989 | 260 | 264 |
| Percent of all industries | 10.3 | 9.8 | 18.4 | 18.4 | 4.0 | 3.6 |
| All industries | 11,544 | 12,723 | 5,020 | 5,378 | 6,524 | 7,345 |

Source: National Science Foundation, Reviews of Data on Science Resources, v. I, No. 1, December 1964.

## INTERNATIONAL

There were no significant shifts in United States trade in the major mineral energy resources during 1964. The combined value of coal and coke exports to Europe (table 41), was slightly below the 1963 level. In the petroleum trade, value of crude petroleum imports into the United States increased slightly during the year, particularly from sources in Asia. The value of refined products imported showed nominal gains from the principal supplying areas. South America remained the source of mineral energy resources imports, which consisted principally of crude petroleum and petroleum products. The major market for U.S. exports of energy resources in 1964 was Europe with coal, coke and petroleum products predominating in shipments. The value of U.S. imports of energy resources increased to $2 billion in 1964 (table 42). During the year, 57 percent of the value of these imports was crude petroleum, while refined products accounted for 36 percent of the total. The value of total exports of energy resources declined 11 percent during the year to $991 million. Petroleum products and coal and coke exports predominate in export shipments. However, the value of petroleum products exported decreased $26 million below the 1963 level.

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**TABLE 41.—Regional distribution of U.S. imports and exports of selected mineral energy resources and related products**

(Thousands)

| SITC[1] No. | Group | North America | South America | Europe | Asia | Africa | Oceania | Soviet bloc |
|---|---|---|---|---|---|---|---|---|
| 321 | Coal, coke, etc.: | | | | | | | |
| | Imports | $14,384 | $1 | $1,602 | $4 | | | $242 |
| | Exports | 136,277 | 21,440 | 240,005 | 66,515 | $240 | $192 | 9,000 |
| 331 | Petroleum, crude, etc.: | | | | | | | |
| | Imports | 310,523 | 539,473 | 2,409 | 260,363 | 35,301 | | |
| | Exports | 22 | | 1,314 | 2,470 | | | |
| 332 | Petroleum products: | | | | | | | |
| | Imports | 377,437 | 333,689 | 3,376 | 9,594 | 721 | [2] | 286 |
| | Exports | 72,360 | 40,061 | 126,182 | 129,694 | 27,308 | 18,084 | 1,339 |
| 341 | Gas, natural, manufactured: | | | | | | | |
| | Imports | 106,042 | 532 | 107 | 21 | | | |
| | Exports | 18,277 | 77 | 356 | 174 | 21 | 175 | 1 |
| | Total selected mineral fuels: | | | | | | | |
| | Imports | 808,386 | 873,695 | 7,494 | 269,982 | 36,022 | [2] | 528 |
| | Exports | 226,936 | 61,578 | 367,857 | 198,853 | 27,569 | 18,361 | 10,340 |
| 521 | Mineral tar and crude chemicals from coal, petroleum, natural gas: | | | | | | | |
| | Imports | 1,112 | | 7,314 | 158 | | 58 | 85 |
| | Exports[3] | 8,856 | 2,709 | 40,188 | 14,950 | 1,165 | 1,608 | 91 |
| | Grand total: | | | | | | | |
| | Imports | 809,498 | 873,695 | 14,808 | 270,140 | 36,022 | 58 | 613 |
| | Exports[3] | 235,792 | 64,287 | 408,045 | 213,803 | 28,734 | 19,969 | 10,431 |

[1] Standard International Trade Classification.
[2] Less than ½ unit.
[3] Plus $10,023,000 special category shipped to all countries.

Source: U.S. Department of Commerce, Bureau of the Census, U.S. Exports 1964, FT-420.

**TABLE 42.—Value of imports and exports, mineral energy resources, and products**

(Thousands)

| SITC[1] No. | Group | Imports for consumption | | | Exports of domestic merchandise | | |
|---|---|---|---|---|---|---|---|
| | | 1962 | 1963 | 1964 | 1962 | 1963 | 1964 |
| 321 | Coal, coke, etc. | $4,187 | $6,301 | $16,233 | $388,710 | $482,058 | $473,579 |
| 331 | Petroleum, crude, etc. | 1,071,650 | 1,065,107 | 1,148,069 | 5,110 | 4,616 | 3,806 |
| 332 | Petroleum products | 656,342 | 707,535 | 725,103 | 411,434 | 441,008 | 415,028 |
| 341 | Gas, natural and manufactured | 91,901 | 103,753 | 106,702 | 15,402 | 17,853 | 19,081 |
| | Total: mineral fuels, lubricants, and related products | 1,824,080 | 1,882,696 | 1,996,107 | 820,656 | 945,535 | 911,494 |
| 521 | Tar, crude chemicals | 46,757 | 34,977 | 8,727 | 67,501 | 65,438 | 79,590 |
| | Grand total | 1,870,837 | 1,917,673 | 2,004,834 | 888,157 | 1,010,973 | 991,084 |

[1] Standard International Trade Classification.

Source: U.S. Department of Commerce, Bureau of the Census. U.S. Exports 1964, FT-420 and U.S. Imports for Consumption 1964, FT-125.

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Table 43 contrasts U.S. production of the major energy resources in 1964 with world production. While U.S. production of crude petroleum increased this was a smaller portion of the world production than in 1963. Commercial gas production and consumption in the United States during the year was a high proportion of the world total. However, no data for world production and consumption are available for 1964. No significant changes were made in 1964 in the ratio of United States to world production of bituminous coal and of anthracite production and consumption.

**TABLE 43.—World production, U.S. production and consumption, selected mineral energy resources**

| Commodity | World production selected mineral energy resources | U.S. production | | U.S. apparent consumption | |
|---|---|---|---|---|---|
| | | Amount | Percent of world production | Amount | Percent of world production |
| | 1963 r | | | | |
| Crude petroleum.....thousand barrels.. | 9,537,420 | 2,752,723 | 29 | 3,170,652 | 33 |
| Natural gas.....million cubic feet.. | NA | 14,341,255 | NA | 14,640,480 | NA |
| Bituminous and lignite thousand short tons.. | 2,725,170 | 458,928 | 17 | 409,225 | 15 |
| Anthracite.....do.... | 201,500 | 18,267 | 9 | 14,200 | 7 |
| | 1964 | | | | |
| Crude petroleum.....thousand barrels.. | 10,327,591 | 2,805,125 | 27 | 3,241,632 | 31 |
| Natural gas.....million cubic feet.. | NA | 15,118,174 | NA | 15,536,373 | NA |
| Bituminous and lignite thousand short tons.. | 2,830,258 | 486,998 | 17 | 431,116 | 15 |
| Anthracite.....do.... | 205,700 | 17,184 | 8 | 14,400 | 7 |

r Revised.
NA Not available.

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# Employment and Injuries in the Fuel Industries

By Forrest T. Moyer [1]

## Contents


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## INTRODUCTION

INJURY experience and related employment information are presented in the chapter for the coal-mining, coking, oil and gas, peat, and native asphalt industries in the United States for 1964. No attempt has been made to combine these data and present injury-frequency rates reflecting the mineral-fuel industries because the hazards of the separate industries are not comparable. All rates in the text are calculated separately on data before rounding, hence component rates may not add to the total rates shown in the tables. Tabulations showing the trend of injuries and employment for all mineral industries are presented in Volume III.

## COAL

Injury experience of the coal mining industry was improved in 1964, as measured by the declines of 1 and 14 percent, respectively, in the frequency and severity rates. Although the total number of injuries increased in 1964, a slightly greater proportional increase in man-hours worked caused the frequency rate to drop to 44.65 per million man-hours. The injury-severity rate in 1964 was 7,832 days lost per million man-hours of exposure. Employment and injury data for 1964 are based on final data for anthracite mines and preliminary data for bituminous coal and lignite mines. Fatality experience improved significantly with a record low number of 240 deaths in 1964. This total was 44 less than in 1963. The Nation's coal mines during 1964 were free of major disasters (a single accident resulting in the death of five men or more) for the first time since 1956. The

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number of nonfatal injuries was 3 percent above the 1963 total. Employment continued to decline but was only slightly lower than in 1963. The decline in employment was compensated by an increase of 7 in the average number of days worked, with the result that total man-hours of worktime showed a 3 percent gain. Employees averaged 7.87 hours of work per day during 1964.

**Bituminous Coal Mines.**—Preliminary data for bituminous coal and lignite mines in 1964 indicated a 2-percent increase in the number of injuries (fatal and nonfatal). However, an accompanying 4-percent increase in man-hours resulted in a better frequency rate of occurrence per million man-hours, 2 percent lower than in 1963. The severity rate of injuries improved 13 percent over the 1963 rate.

The number of fatal injuries showed a sharp decrease of 14 percent in 1964. The frequency and severity rates of 0.90 and 5,376, respectively, were both 17 percent better than the corresponding 1963 rates of 1.09 and 6,513. Of the 216 fatalities, 187 occurred underground, 13 on the surface, 15 at strip mines, and 1 at an auger mine. Three types of accident caused 89 percent of the overall death total. Falls of roof, face, or rib killed 114 men (53 percent); haulage accidents took 53 lives (24 percent); and machinery accounted for 25 fatalities (12 percent). The remaining fatalities resulted from a variety of causes such as electricity, explosions, explosives, and others. The Bureau of Mines estimated that 10,090 nonfatal lost-time injuries occurred in 1964, 252 more than in 1963. The average number of men working decreased slightly in 1964; days active increased by 8 to a total of 212 days; and worktime increased nearly 9 million man-hours.

**TABLE 1.—Employment and injury experience at coal mines in the United States, 1960–64**

| Industry and year | Average men working daily [1] | Average active mine days [2] | Man-days worked (thousand) | Man-hours worked (thousand) | Number of injuries | | Injury rates per million man-hours | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Fatal | Nonfatal | Frequency | Severity |
| Bituminous coal mines: [3] | | | | | | | | |
| 1960 | 170,628 | 190 | 32,417 | 257,075 | 290 | 10,501 | 41.98 | 9,270 |
| 1961 | 151,776 | 194 | 29,453 | 232,871 | 275 | 9,902 | 43.70 | 9,778 |
| 1962 | 147,276 | 196 | 28,863 | 228,267 | 263 | 9,783 | 44.01 | 9,712 |
| 1963 | 143,628 | 204 | 29,289 | 232,136 | 252 | 9,838 | 43.47 | 8,894 |
| 1964 [p] | 143,300 | 212 | 30,404 | 241,060 | 216 | 10,090 | 42.75 | 7,678 |
| Anthracite mines: | | | | | | | | |
| 1960 | 19,051 | 176 | 3,360 | 24,452 | 35 | 1,401 | 58.73 | 10,485 |
| 1961 | 15,792 | 196 | 3,098 | 22,424 | 19 | 1,205 | 58.60 | 7,702 |
| 1962 | 14,010 | 204 | 2,853 | 20,690 | 26 | 1,161 | 57.40 | 9,421 |
| 1963 | 13,498 | 216 | 2,912 | 21,048 | 32 | 1,295 | 63.05 | 12,367 |
| 1964 | 13,144 | 214 | 2,812 | 20,368 | 24 | 1,342 | 67.07 | 9,650 |
| Total coal mines: [4] | | | | | | | | |
| 1960 | 189,679 | 189 | 35,778 | 281,528 | 325 | 11,902 | 43.43 | 9,376 |
| 1961 | 167,568 | 194 | 32,551 | 255,296 | 294 | 11,197 | 45.01 | 9,598 |
| 1962 | 161,286 | 197 | 31,716 | 248,946 | 289 | 10,944 | 45.12 | 9,668 |
| 1963 | 157,126 | 205 | 32,200 | 253,185 | 284 | 11,133 | 45.09 | 9,126 |
| 1964 [p] | 156,444 | 212 | 33,216 | 261,428 | 240 | 11,432 | 44.65 | 7,832 |

[p] Preliminary.
[1] Average number of men at work each day mine was active. Because absenteeism and labor turnover were considered, this number is lower than number of men available for work, as measured by a count of names on payroll.
[2] Average in which operating time of each mine is weighted by average number of workers in mines.
[3] Includes lignite.
[4] Data may not add to total shown because of rounding.

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**Anthracite Mines.**—The rate of occurrence of injuries in anthracite mining increased to 67.07 per million man-hours, 6 percent above the 1963 rate. On the other hand, the severity rate was 22 percent better than in 1963, owing principally to the sharp drop in the number of fatal injuries in 1964.

The fatality-frequency rate (1.18) improved 22 percent compared with that of 1963; however, the nonfatal rate (65.89) was 7 percent higher than the corresponding rate for 1963. Of the 24 deaths reported, 22 occurred underground and 2 at preparation plants. Falls of roof, face, or rib claimed nine lives; haulage, five; explosions, explosives, and miscellaneous causes, three each; and an inrush of water, one. Nonfatal injuries totaled 1,342 in 1964, and records show that 917 occurred underground, 167 at strip mines, 15 at culm banks, 2 at dredges, 179 at preparation plants, and 62 at surface operations.

Employment continued to decline with 3-percent fewer men working than in 1963. Employees worked 3-percent fewer man-hours and averaged 1,550 hours for the year, 9 hours less than in 1963. Anthracite mines were active 214 days, 2 less than in 1963.

## COKE

The overall injury-frequency rate of the coking industry in 1964 was 11 percent better than in 1963. Only one fatality was reported in 1964, compared with seven in the preceding year. The number of nonfatal disabilities declined 4 percent from the 1963 figure. The injury-severity rate of the industry, available for the first time in 1964, was 795 days lost per million man-hours of work.

Operating activity of the industry was higher, and the average number of men working daily advanced to 13,447, 3 percent greater than in 1963. The total man-hours of worktime also increased 5 percent in 1964, and the plants were active an average of 357 days, 5 more than in 1963. Employees averaged 2,857 hours during the year and worked an 8-hour shift.

**Slot Ovens.**—Injuries (fatal and nonfatal) at slot ovens dropped 16 percent in number and 19 percent in frequency of occurrence per million man-hours of worktime. Employment increased 3 percent in 1964, and total man-hours gained 4 percent. Slot oven workers had an 8-hour shift and produced 1.7 tons of coke per man-hour. There was no work stoppage in 1964, and the plants were active 6 days more than in 1963.

**Beehive Ovens.**—No fatalities occurred at beehive ovens in 1964 for the second consecutive year. Nonfatal injuries increased 74 percent in number and 33 percent in frequency of occurrence over those of 1963. Employment and man-hours increased 23 and 31 percent, respectively, and employees averaged 1,744 hours for the year while working a 7.9-hour shift.

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TABLE 2.—Employment and injury experience at coke ovens in the United States, 1960–64 [1]

| Industry and year | Average men working daily [2] | Average active mine days [3] | Man-days worked (thousand) | Man-hours worked (thousand) | Number of injuries | | Injury rates per million man-hours | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Fatal | Non-fatal | Frequency | Severity |
| Slot ovens: | | | | | | | | |
| 1960 | 15,779 | 360 | 5,673 | 45,353 | 3 | 177 | 3.97 | NA |
| 1961 | 13,106 | 359 | 4,707 | 37,661 | 3 | 167 | 4.51 | NA |
| 1962 | 12,723 | 363 | 4,623 | 36,969 | 9 | 237 | 6.65 | NA |
| 1963 | 12,696 | 356 | 4,524 | 36,192 | 7 | 190 | 5.44 | NA |
| 1964 | 13,021 | 362 | 4,713 | 37,675 | 1 | 164 | 4.38 | 703 |
| Behive ovens: | | | | | | | | |
| 1960 | 684 | 139 | 95 | 712 | -- | 46 | 64.57 | NA |
| 1961 | 428 | 196 | 84 | 645 | -- | 26 | 40.33 | NA |
| 1962 | 357 | 191 | 68 | 533 | 2 | 15 | 31.89 | NA |
| 1963 | 347 | 209 | 73 | 567 | -- | 23 | 40.57 | NA |
| 1964 | 426 | 220 | 94 | 743 | -- | 40 | 53.83 | 5,457 |
| All ovens: [4] | | | | | | | | |
| 1960 | 16,463 | 350 | 5,768 | 46,066 | 3 | 223 | 4.91 | NA |
| 1961 | 13,534 | 354 | 4,791 | 38,306 | 3 | 193 | 5.12 | NA |
| 1962 | 13,080 | 359 | 4,691 | 37,502 | 11 | 252 | 7.01 | NA |
| 1963 | 13,043 | 352 | 4,596 | 36,759 | 7 | 213 | 5.98 | NA |
| 1964 | 13,447 | 357 | 4,807 | 38,418 | 1 | 204 | 5.34 | 795 |

NA Not available.
[1] All data are final.
[2] Average number of men at work each day oven was active. Because absenteeism and labor turnover are taken into consideration, this number is lower than the number of men available for work, as measured by a count of names on payroll.
[3] Average in which operating time of each plant is weighted by average number of workers in the plant.
[4] Man-days and man-hours of employment have been rounded to the nearest thousand and will not necessarily add to published totals.

## OIL AND GAS

Injury experience for the oil and gas industries in 1964 was not as favorable as in 1963. The frequency rate of 9.51 injuries per million man-hours was 1 percent above that of 1963, and the severity rate of 1,172 days lost per million man-hours showed an increase of 13 percent. Although the total number of injuries was 6 percent lower than the 1963 record, a greater proportional decrease of 7 percent in man-hours caused the frequency and severity rates to rise. Also contributing to the increased severity rate were increases in fatal and permanent total injuries.

Disabling injuries included 109 fatalities and 10 permanent total, 433 permanent partial, and 8,108 temporary total disabilities. For permanent partial and temporary total disabilities the average time loss was 41 days, a decline of 4 days. However, the average severity of all injuries in 1964 was 123 days, compared with 110 days in 1963.

Seven segments of the industries improved their injury experience; the five that did not were exploration, production, pipeline gas, research and engineering, and miscellaneous. Severity rates of injuries dropped in the following six areas: drilling, natural gasoline, pipeline oil, pipeline gas, marine transportation (ocean and coastwise), and refining. The remaining six helped account for the 132-day rise in the severity rate of all injuries. Reduced rates occurred in both frequency and severity in the drilling, natural gasoline, pipeline oil, marine transportation (ocean and coastwise), and refining areas.

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**TABLE 3.—Employment and injury experience of the oil industry (all activities) and the natural gas industry (excluding distribution activities) in the United States, 1960–64**

| Year | Average men working daily | Man-hours worked (thousand) | Number of injuries [1] | | Injury rates per million man-hours | |
|---|---|---|---|---|---|---|
| | | | Fatal | Nonfatal | Frequency | Severity |
| 1960 | 511,107 | 1,063,332 | 82 | 9,110 | 8.64 | 812 |
| 1961 | 452,721 | 951,743 | 111 | 8,697 | 9.25 | 1,077 |
| 1962 | 469,256 | 984,172 | 121 | 9,336 | 9.61 | 1,124 |
| 1963 | 461,021 | 974,877 | 93 | 9,125 | 9.46 | 1,040 |
| 1964 | 427,697 | 910,525 | 109 | 8,551 | 9.51 | 1,172 |

[1] Fatal and permanent total injuries combined for 1960 through 1962. Permanent total injuries included in the nonfatal injury total thereafter.

## PEAT

There were no fatalities reported in the extraction and processing of peat in 1964; the last fatality occurred in 1959. However, the number of nonfatal injuries more than doubled to a total of 24, occurring at the rate of 21.39 per million man-hours of exposure. The 4 injuries that occurred in the extraction of peat resulted in a frequency rate of 8.40, while 20 injuries in the processing of peat occurred at a rate of 30.97.

Of the 24 nonfatal injuries, 2 were permanent partial disabilities, one from a haulage accident and the other from machinery. Handling material accidents were the ranking cause and accounted for seven injuries. Slips or falls of persons and machinery accidents each caused six injuries, and three resulted from haulage accidents. Miscellaneous causes accounted for the remaining injuries. The average number of men totaled 781, 16 percent greater than in 1963. This gain in employment, coupled with a larger number of active days, resulted in a 17-percent increase in total man-hours worked in the industry.

**TABLE 4.—Employment and injury experience in the peat industry in the United States, 1960–64**

| Year | Average men working daily | Man-hours worked (thousand) | Number of injuries | | Injury rates per million man-hours | |
|---|---|---|---|---|---|---|
| | | | Fatal | Nonfatal | Frequency | Severity |
| 1960 | 576 | 866 | ---- | 24 | 27.72 | 715 |
| 1961 | 765 | 1,038 | ---- | 17 | 16.38 | 747 |
| 1962 | 683 | 977 | ---- | 19 | 19.46 | 300 |
| 1963 | 674 | 957 | ---- | 11 | 11.49 | 510 |
| 1964 | 781 | 1,122 | ---- | 24 | 21.39 | 1,851 |

## NATIVE ASPHALT

The rate of occurrence of injuries in the native asphalt operations during 1964 was improved slightly to 41.97 per million man-hours. However, the injury-severity rate of 16,701 days lost per million man-hours was appreciably worse than in 1963.

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Two fatalities occurred in 1964, one resulting from a fall of person in the mill and the other from a handling material accident in an open pit mine. The fatalities had a frequency rate of 2.62 per million man-hours of exposure, compared with a rate of 2.29 in 1963 when two fatalities were reported. A total of 30 nonfatal injuries occurred at the frequency rate of 39.34 per million man-hours, a 2-percent decrease from the 1963 figure. The severity rate for nonfatal injuries was 963 days lost per million man-hours, a 17-percent increase over the 1963 rate of 823 days. Seventeen nonfatal injuries were reported in processing plant, 8 in underground, and 5 at surface operations. The leading causes of the nonfatal injuries reported for 1964 follow: nine disabilities resulting from slips or falls; 7 from machinery; and 6 each from haulage and handling material accidents. The average number of men employed in 1964 dropped 12 percent to 369, compared with 417 employed in 1963. Man-hours of worktime also decreased 13 percent from the 1963 figure.

**TABLE 5.—Employment and injury experience at bituminous limestone, bituminous sandstone, and gilsonite mines and mills in the United States, 1960–64**

| Year | Average men working daily | Average active days | Man-days worked (thousand) | Man-hours worked (thousand) | Number of injuries | | Injury rates per million man-hours | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Fatal | Nonfatal | Frequency | Severity |
| 1960 | 445 | 264 | 117 | 948 | 1 | 38 | 41.16 | 7,119 |
| 1961 | 383 | 256 | 98 | 792 | 1 | 30 | 39.17 | 8,766 |
| 1962 | 358 | 279 | 100 | 800 | | 13 | 16.25 | 146 |
| 1963 | 417 | 260 | 108 | 873 | 2 | 35 | 42.41 | 14,576 |
| 1964 | 369 | 256 | 94 | 762 | 2 | 30 | 41.97 | 16,701 |

## CONCLUSION

Although man-hours of exposure to work hazards increased in coal mining and the coking of coal, the frequency rate of disabling injuries declined in 1964 in these two industries. The rate of occurrence of injuries improved also in the native asphalt industry, but worsened in the oil and gas and peat industries. Coal mines and coke ovens were active more days than in 1963, while mines in the native asphalt industry were worked 4 fewer days in 1964.

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# Coal—Bituminous and Lignite

By W. H. Young [1] and R. L. Anderson [2]

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## GENERAL SUMMARY

PRODUCTION of bituminous coal and lignite increased substantially in 1964. There were upward trends also in consumption, average value, exports, mechanization, and productivity. However, a significant decline in employment continued.

**Production.**—The output of bituminous coal and lignite in the United States in 1964—487 million tons—was 6 percent greater than the 459 million tons produced in 1963. The gain was attributed largely to expanded consumption by the electric utilities, greater use at coke ovens, and an increase in exports.

The major seasonal fluctuation in production, as in the past, resulted from the miners' vacation period of 12 days in midsummer. According to the Bureau of Labor Statistics, U.S. Department of Labor, time lost because of strikes totaled 340,000 man-days in 1964, compared with 234,000 man-days in 1963.

**Trend of Employment.**—Employment decreased 9 percent compared with 1963, due largely to increasing mechanization.

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**Index to Capacity.**—As it is impossible for all mines to operate every working day in the year, an estimate of 280 days for calculating potential capacity was suggested some years ago by the coal committee of the American Institute of Mining, Metallurgical and Petroleum Engineers. The average output per day worked in 1964 was 2.2 million tons, which, if applied to 280 days, gives an annual potential output of 606 million tons, compared with the actual production of 487 million tons. This figure is not a measure of practical productive capacity of the industry because availability of railroad coal cars and other factors bearing on the ability of the industry to produce are not reflected in this computation.

**Mechanization.**—Coal output that was loaded mechanically at underground mines in the United States—87 percent—was 1 percent greater than in the previous year.

**Mechanical Cleaning.**—Approximately 64 percent of the bituminous coal and lignite mined in the United States in 1964 was mechanically cleaned. The growth of mechanical cleaning closely paralleled that of mechanical mining, partly because more refuse was loaded with the coal. Moreover, the bituminous coal and lignite industry has attempted to meet the consumer demand for cleaner coal. A large part of the remaining 36 percent was handpicked and screened into various sizes at tipples where no mechanical cleaning facilities existed.

**Consumption.**—Consumption of bituminous coal and lignite in the United States increased 5 percent, principally in electric utilities and at coke ovens. The remaining principal types of consumers used slightly more coal than in the previous year.

**Trends of Fuel Efficiency.**—For the fourth time in as many years, the fuel efficiency of electric power utilities failed to establish a new record; it remained at 0.86 pound per kilowatt-hour, the same as in 1961, 1962, and 1963.

**Competition with Oil and Gas.**—Although consumption of energy has increased steadily since 1920, the proportion supplied by bituminous coal and lignite has decreased consistently as a result of serious competition from oil and gas, with the exception of a slight increase in 1964. Of total energy consumed in 1964, bituminous coal and lignite furnished 22 percent; anthracite, 1 percent; oil, 40 percent; gas, 33 percent; and waterpower, 4 percent.

Electric utilities consumed 6.6 percent more bituminous coal, 8 percent more gas, and 8 percent more fuel oil in 1964.

**Stocks.**—The reserve supply of bituminous coal and lignite in the hands of industrial consumers and retail coalyards was 75 million tons at the end of the year or 8 percent greater than for the previous year. Days supply increased from 54 to 56 days. Stocks on the upper lake docks decreased 348,106 tons from January 1 to December 31, 1964.

**Exports.**—Exports totaled 48 million tons, increasing 2 percent over those of 1963; 34 million tons was shipped overseas and 14 million tons was shipped to Canada.

## SCOPE OF REPORT

These data include all coal produced in the United States except Pennsylvania anthracite, Texas lignite, and bituminous coal and lignite from mines that produced less than 1,000 tons per year.

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Throughout the chapter all tonnage figures show net tons of marketable coal and exclude washery and other refuse. "Tons" refers to net or short tons of 2,000 pounds.

Statistics are final and are based upon detailed annual reports of production and mine operation furnished by producers. All but a small percentage of the output was covered by the reports submitted. For production not directly reported (chiefly that of small mines), accurate data were obtained from the records of the various State mine departments (which have statutory authority to require such reports) or in a few instances, from railroad carloadings. Thus, complete coverage of all mines producing 1,000 tons a year or more is reported. Inclusion of many small mines that produce less than 1,000 tons per year was not attempted.

From 1955 to date the annual production form did not request information on employment. These figures for men working daily, days worked, man-days worked, and tons per man per day were obtained from the Accident Analysis Branch of the Bureau of Mines.

Statistical procedures are also detailed in the following sections: Production by months and weeks, number and size of mines, mechanical cleaning, production by States and counties, consumption, and stocks.

**TABLE 1.—Salient statistics of the bituminous coal and lignite industry in the United States**

| Item | 1963 | 1964 | Change from 1963 (percent) |
|---|---|---|---|
| Production—net tons | 458,928,175 | 486,997,952 | +6.1 |
| Consumption—do | 409,225,000 | 431,116,000 | +5.3 |
| Stocks at end of year: | | | |
| Industrial consumers and retail yards—do | 70,083,000 | 75,342,000 | +7.5 |
| Stocks on upper lake docks—do | 2,945,665 | 2,597,559 | −11.8 |
| Imports and exports: [1] | | | |
| Imports—do | 267,352 | 293,059 | +9.6 |
| Exports—do | 47,078,435 | 47,969,423 | +1.9 |
| Price indicators, average per net ton: | | | |
| Cost of coking coal at merchant coke ovens | $9.35 | $9.85 | +5.3 |
| Retail price [2] | $17.46 | NA | ------ |
| Railroad freight charge [3] | $3.21 | NA | ------ |
| Value f.o.b. mines (sold in open market) | $4.12 | $4.11 | −.2 |
| Value f.o.b. mines | $4.39 | $4.45 | +1.4 |
| Equipment sold: | | | |
| Mobile loading machines | 89 | 111 | +24.7 |
| Continuous mining machines | 137 | 150 | +9.5 |
| Augers | 36 | 26 | −27.8 |
| Shuttle cars | 196 | 311 | +58.7 |
| Conveyors: | | | |
| Gathering and haulage | 199 | 204 | +2.5 |
| Room or transfer | 81 | 70 | −13.6 |
| Method of mining: | | | |
| Hand loaded underground—net tons | 43,015,565 | 40,707,408 | −5.4 |
| Mechanically loaded underground—do | 259,240,835 | 281,100,506 | +8.4 |
| Percentage of total underground production mechanically loaded | 85.8 | 87.4 | +1.9 |
| Mined by stripping—net tons | 144,140,677 | 151,858,979 | +5.4 |
| Mined at auger mines—do | 12,531,098 | 13,331,059 | +6.4 |
| Mechanically cleaned—do | 289,462,405 | 310,202,742 | +7.2 |
| Number of mines | 7,940 | 7,630 | −3.9 |
| Average number of days worked [4] | 205 | 225 | +9.8 |
| Average number of men working daily [4] | 141,646 | 128,698 | −9.1 |
| Production per man per day [4] | 15.83 | 16.84 | +6.4 |
| Fuel efficiency indicator: Pounds of coal per kilowatt-hour at electric power plants [5] | 0.86 | 0.86 | ------ |

NA Not available.
[1] Bureau of the Census.
[2] Bureau of Labor Statistics, U.S. Department of Labor.
[3] Interstate Commerce Commission.
[4] Accident Analysis Branch, Bureau of Mines.
[5] Federal Power Commission.

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# RESERVES

## TABLE 2.—Coal reserves of the United States, January 1, 1960, by States

(Million short tons)

| State | Date of publication of estimate | Estimated original reserves | | | | Total | Reserves depleted to Jan. 1, 1960 | | Remaining reserves, Jan. 1, 1960 | Recoverable reserves, Jan. 1, 1960, assuming 50 percent recovery |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Bituminous coal | Subbituminous coal | Lignite | Anthracite and semi-anthracite | | Production [1] | Production plus loss in mining [2] | | |
| ALABAMA [3] | (4) | [5] 13,754 | | 20 | | [5] 13,774 | [6] 23 | [6] 46 | 13,728 | 6,864 |
| ALASKA | (7) | 21,401 | [8] 71,136 | (8) | 2,101 | 94,638 | 13 | 26 | 94,612 | 47,306 |
| ARKANSAS | 1960 | 1,816 | | 350 | 456 | 2,622 | 99 | 198 | 2,424 | 1,212 |
| COLORADO | 1959 | 63,203 | 18,492 | | 90 | 81,785 | 506 | 1,012 | 80,773 | 40,387 |
| GEORGIA | 1953 | 100 | | | | 100 | 12 | 24 | 76 | 38 |
| ILLINOIS | 1953 | 137,329 | | | | [9] 137,329 | [10] 474 | [10] 948 | 136,381 | 68,190 |
| INDIANA | 1953 | 37,293 | | | | 37,293 | 1,148 | 2,296 | 34,997 | 17,499 |
| Iowa [11] | 1909 | 29,160 | | | | 29,160 | 357 | 714 | 28,446 | 14,223 |
| KANSAS | B–1951<br>L–1952 | [9] 20,774 | | (12) | | [9] 20,774 | [10] 13 | [10] 26 | 20,748 | 10,374 |
| KENTUCKY | (4) | 72,318 | | | | 72,318 | 2,646 | 5,292 | 67,026 | 33,513 |
| MARYLAND | 1953 | [9] 1,200 | | | | [9] 1,200 | [10] 6 | [10] 12 | 1,188 | 594 |
| MICHIGAN | 1950 | 297 | | | | 297 | 46 | 92 | 205 | 102 |
| Missouri | 1913 | 79,362 | | | | 79,362 | 287 | 574 | 78,788 | 39,394 |
| MONTANA | 1949 | 2,363 | 132,151 | 87,533 | | 222,047 | 171 | 342 | 221,705 | 110,853 |
| NEW MEXICO | 1950 | 10,948 | 50,801 | | 6 | 61,755 | 125 | 250 | 61,505 | 30,753 |
| NORTH CAROLINA | 1955 | 112 | | | | 112 | 1 | 2 | 110 | 55 |
| NORTH DAKOTA | 1953 | | | 350,910 | | 350,910 | 96 | 192 | 350,718 | 175,359 |
| OHIO | 1960 | 46,488 | | | | 46,488 | 2,052 | 4,104 | 42,384 | 21,192 |
| OKLAHOMA | 1957 | 3,673 | | (12) | | 3,673 | 180 | 360 | 3,313 | 1,656 |
| OREGON | 1955 | 20 | 180 | | | 200 | 3 | 6 | 194 | 97 |
| PENNSYLVANIA | B–1928<br>A–1945 | 75,093 | | | 22,805 | 97,898 | 13,508 | 27,016 | 70,882 | 35,441 |
| SOUTH DAKOTA | 1952 | | | 2,033 | | 2,033 | 1 | 2 | 2,031 | 1,015 |
| TENNESSEE | 1959 | [13] 1,912 | | | | [13] 1,912 | [14] 6 | [14] 12 | 1,900 | 950 |
| TEXAS [15] | B–1909<br>L–1955 | 8,000 | | 7,070 | | 15,070 | 95 | 190 | 14,880 | 7,440 |
| UTAH | (7) | 28,222 | 156 | | | 28,378 | 260 | 520 | 27,858 | 13,929 |
| VIRGINIA | 1952 | 11,696 | | | 355 | 12,051 | 782 | 1,564 | 10,487 | 5,244 |
| Washington | 1929 | 11,413 | [8] 52,442 | (8) | 23 | 63,878 | 149 | 298 | 63,580 | 31,790 |
| WEST VIRGINIA | 1940 | 116,618 | | | | 116,618 | 6,369 | 12,738 | 103,880 | 51,940 |
| WYOMING | 1950 | 13,235 | [8] 108,319 | (8) | | 121,554 | 402 | 804 | 120,750 | 60,375 |
| Other States | | [16] 620 | [17] 4,065 | [18] 50 | | 4,735 | 7 | 14 | 4,721 | 2,360 |
| Total | | 808,420 | 437,742 | 447,966 | 25,836 | 1,719,964 | [19] 29,837 | 59,674 | 1,660,290 | 830,145 |

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[1] Production, 1800 through 1885, from "The first century and a quarter of American coal industry," by H. N. Eavenson, privately printed, Pittsburgh, 1942; production, 1886 through 1923, from U.S. Geological Survey Mineral Resources, annual volumes; production, 1924 through 1957, from Bureau of Mines, Minerals Yearbook, annual volumes, augmented for some States by records of State mine inspectors; production, 1958, from Bureau of Mines, Mineral Market Summary 2974, Sept. 9, 1959; production, 1959, from Bureau of Mines weekly coal reports and partly estimated.
[2] Assuming past losses equal past production.
[3] Reserve estimates of States in capital letters supersede earlier estimates of M. R. Campbell.
[4] New estimate from report in preparation or in press.
[5] Remaining reserves, Jan. 1, 1958.
[6] Production 1958 and 1959 only.
[7] New estimate presented for first time in this report.
[8] Small reserves and production of lignite included under subbituminous coal.
[9] Remaining reserves, Jan. 1, 1950
[10] Production 1950 through 1959.
[11] Reserve estimates of States in lowercase letters were prepared by or under the direction of M. R. Campbell before 1928.
[12] Small reserves of lignite in beds generally less than 30 inches thick.
[13] Remaining reserves, Jan. 1, 1959.
[14] Estimated production 1959 only.
[15] New estimate of lignite reserves; Campbell estimate of bituminous coal reserves.
[16] ARIZONA, CALIFORNIA, Idaho, Nebraska, and Nevada.
[17] ARIZONA, CALIFORNIA, and Idaho.
[18] CALIFORNIA, Idaho, Louisiana, and Nevada.
[19] Less than total recorded production of about 34.8 billion tons. See footnotes 5, 6, 9, 10, 13, and 14.

**Source: Averitt, Paul. Coal Reserves of the United States—A Progress Report January 1, 1960. Geol. Survey Bull. 1136, 1961, pp. 10–11.**



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## THICKNESS OF BITUMINOUS COAL AND LIGNITE SEAMS

The Bureau of Mines compiled and published detailed data on thickness of seams for coal mines in 1960.[3] Because of the importance of seam thickness in mining, these data for 1960 follow.

**TABLE 3.—Number and production of bituminous coal and lignite mines in the United States 1960 classified by thickness of seams mined**

| Item | Less than 2 feet | 2 to 3 feet | 3 to 4 feet | 4 to 5 feet | 5 to 6 feet | 6 to 7 feet | 7 to 8 feet | 8 feet and over | Total |
|---|---|---|---|---|---|---|---|---|---|
| Number of mines: | | | | | | | | | |
| Underground | 35 | 1,811 | 2,178 | 990 | 449 | 266 | 132 | 128 | 5,989 |
| Strip | 140 | 510 | 418 | 222 | 106 | 52 | 22 | 60 | 1,530 |
| Auger | 3 | 71 | 129 | 94 | 40 | 8 | ----- | 1 | 346 |
| Total | 178 | 2,392 | 2,725 | 1,306 | 595 | 326 | 154 | 189 | 7,865 |
| Percentage of mines: | | | | | | | | | |
| Underground | 0.6 | 30.2 | 36.4 | 16.5 | 7.5 | 4.5 | 2.2 | 2.1 | 100.0 |
| Strip | 9.2 | 33.3 | 27.3 | 14.5 | 6.9 | 3.4 | 1.5 | 3.9 | 100.0 |
| Auger | .9 | 20.4 | 37.3 | 27.2 | 11.6 | 2.3 | ----- | .3 | 100.0 |
| Total | 2.3 | 30.4 | 34.6 | 16.6 | 7.6 | 4.1 | 2.0 | 2.4 | 100.0 |
| Production (thousand tons): | | | | | | | | | |
| Underground | 231 | 20,851 | 65,322 | 49,633 | 53,928 | 39,833 | 29,665 | 25,425 | 284,888 |
| Strip | 5,660 | 19,503 | 32,934 | 30,456 | 17,692 | 7,126 | 3,546 | 5,713 | 122,630 |
| Auger | 44 | 939 | 2,781 | 2,965 | 971 | 235 | ----- | 59 | 7,994 |
| Total | 5,935 | 41,293 | 101,037 | 83,054 | 72,591 | 47,194 | 33,211 | 31,197 | 415,512 |
| Percentage of production: | | | | | | | | | |
| Underground | 0.1 | 7.3 | 22.9 | 17.4 | 19.0 | 14.0 | 10.4 | 8.9 | 100.0 |
| Strip | 4.6 | 15.9 | 26.9 | 24.8 | 14.4 | 5.8 | 2.9 | 4.7 | 100.0 |
| Auger | .5 | 11.7 | 35.0 | 37.1 | 12.1 | 2.9 | ----- | .7 | 100.0 |
| Total | 1.4 | 9.9 | 24.3 | 20.0 | 17.5 | 11.4 | 8.0 | 7.5 | 100.0 |

[3] Young, W. H., and R. L. Anderson. Thickness of Bituminous Coal and Lignite Seams Mined in 1960. BuMines Inf. Circ. 8118, 1962, 19 pp.

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**TABLE 4.—Number of mines, production, output per man per day, and average thickness of seams mined, at underground, strip, and auger bituminous coal and lignite mines in the United States, 1960, by States**

| State | Underground mines | | | | Strip mines | | | | Auger mines | | | | Total, all mines | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of mines | Production (net tons) | Average output per man per day (tons) | Average thickness of seams mined (feet) | Number of mines | Production (net tons) | Average output per man per day (tons) | Average thickness of seams mined (feet) | Number of mines | Production (net tons) | Average output per man per day (tons) | Average thickness of seams mined (feet) | Number of mines | Production (net tons) | Average output per man per day (tons) | Average thickness of seams mined (feet) |
| Alabama | 135 | 10,365,340 | 7.80 | 4.1 | 39 | 2,558,414 | 14.96 | 2.8 | 3 | 86,893 | 26.32 | 2.7 | 177 | 13,010,647 | 8.66 | 3.8 |
| Alaska | 2 | 66,982 | 6.01 | 20.9 | 6 | 655,489 | 15.43 | 34.6 | | | | | 8 | 722,471 | 13.47 | 34.3 |
| Arizona | 2 | 5,526 | 2.02 | 5.5 | | | | | | | | | 2 | 5,526 | 2.02 | 5.5 |
| Arkansas | 10 | 112,774 | 4.24 | 2.6 | 10 | 296,425 | 13.38 | 1.8 | | | | | 20 | 409,199 | 8.39 | 2.0 |
| Colorado | 87 | 2,914,437 | 8.06 | 7.6 | 7 | 692,849 | 28.46 | 8.4 | | | | | 94 | 3,607,286 | 9.34 | 7.8 |
| Georgia | 2 | 4,215 | 1.84 | 1.5 | | | | | | | | | 2 | 4,215 | 1.84 | 1.5 |
| Illinois | 59 | 23,306,901 | 17.38 | 7.5 | 69 | 22,670,585 | 30.04 | 5.0 | | | | | 128 | 45,977,486 | 21.94 | 6.3 |
| Indiana | 34 | 4,752,902 | 11.96 | 5.8 | 47 | 10,784,967 | 29.50 | 4.6 | | | | | 81 | 15,537,869 | 20.36 | 5.0 |
| Iowa | 19 | 200,100 | 4.51 | 4.9 | 25 | 867,924 | 18.15 | 4.5 | | | | | 44 | 1,068,024 | 11.58 | 4.6 |
| Kansas | 2 | 3,584 | 2.41 | 2.1 | 11 | 884,690 | 17.11 | 1.5 | | | | | 13 | 888,274 | 16.70 | 1.5 |
| Kentucky | 1,630 | 44,468,474 | 10.61 | 4.3 | 129 | 19,672,192 | 36.16 | 4.9 | 105 | 2,705,826 | 30.30 | 4.1 | 1,864 | 66,846,492 | 13.86 | 4.5 |
| Maryland | 48 | 260,198 | 4.37 | 3.2 | 37 | 487,636 | 15.51 | 4.3 | | | | | 85 | 747,834 | 8.22 | 3.9 |
| Missouri | 10 | 88,273 | 3.06 | 3.6 | 23 | 2,801,937 | 11.83 | 2.2 | | | | | 33 | 2,890,210 | 10.88 | 2.2 |
| Montana (bituminous and lignite) | 14 | 115,993 | 6.17 | 6.6 | 5 | 197,430 | 37.34 | 16.6 | | | | | 19 | 313,423 | 13.01 | 12.9 |
| New Mexico | 18 | 249,762 | 6.32 | 6.3 | 1 | 45,000 | 45.00 | 3.0 | | | | | 19 | 294,762 | 7.27 | 5.8 |
| North Dakota (lignite) | 1 | 2,403 | 7.30 | 9.0 | 31 | 2,522,552 | 37.07 | 11.0 | | | | | 32 | 2,524,955 | 36.93 | 11.0 |
| Ohio | 149 | 9,206,400 | 10.95 | 4.9 | 265 | 23,883,289 | 23.59 | 3.7 | 56 | 867,083 | 42.45 | 3.8 | 470 | 33,956,772 | 18.13 | 4.0 |
| Oklahoma | 11 | 247,568 | 3.10 | 3.4 | 15 | 1,093,965 | 16.34 | 1.7 | | | | | 26 | 1,341,533 | 9.14 | 2.0 |
| Pennsylvania | 680 | 44,070,560 | 9.04 | 5.5 | 553 | 20,875,533 | 17.03 | 3.2 | 49 | 479,172 | 18.53 | 3.6 | 1,282 | 65,425,265 | 10.68 | 4.8 |
| South Dakota (lignite) | | | | | 1 | 20,448 | 10.10 | 4.5 | | | | | 1 | 20,448 | 10.10 | 4.5 |
| Tennessee | 332 | 3,938,626 | 6.70 | 4.2 | 71 | 1,763,913 | 20.97 | 2.9 | 12 | 227,911 | 25.93 | 3.7 | 415 | 5,930,450 | 8.71 | 3.8 |
| Utah | 45 | 41,954,693 | 10.71 | 10.8 | | | | | | | | | 45 | 4,954,693 | 10.71 | 10.8 |
| Virginia | 1,201 | 25,819,830 | 9.44 | 5.6 | 35 | 1,370,864 | 26.77 | 4.1 | 32 | 647,201 | 33.04 | 3.5 | 1,268 | 27,837,895 | 9.92 | 5.5 |
| Washington | 9 | 211,968 | 6.30 | 7.8 | 1 | 16,177 | 9.77 | 2.9 | | | | | 10 | 228,145 | 6.46 | 7.5 |
| West Virginia | 1,479 | 109,209,989 | 11.78 | 5.1 | 140 | 6,754,001 | 13.65 | 4.9 | 89 | 2,980,287 | 34.30 | 4.6 | 1,708 | 118,944,277 | 12.07 | 5.1 |
| Wyoming | 10 | 310,812 | 7.60 | 7.5 | 9 | 1,713,384 | 39.20 | 45.9 | | | | | 19 | 2,024,196 | 23.93 | 40.0 |
| Total | 5,989 | 284,888,310 | 10.64 | 5.4 | 1,530 | 122,629,664 | 22.93 | 5.1 | 346 | 7,994,373 | 31.36 | 4.2 | 7,865 | 415,512,347 | 12.83 | 5.3 |

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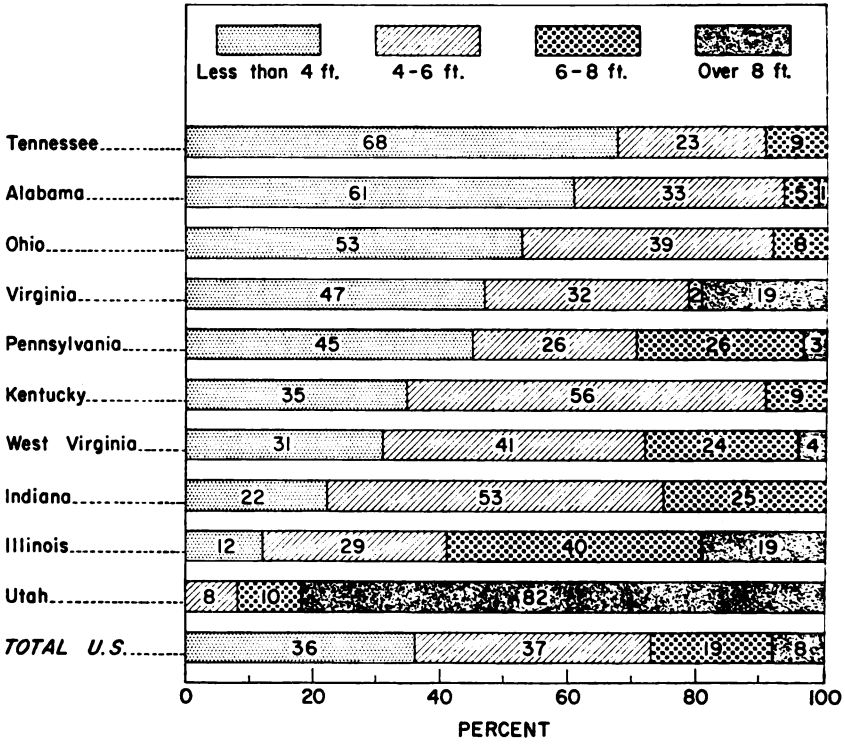


FIGURE 1.—Percentage of bituminous coal and lignite produced in the 10 leading coal-producing States and total United States, 1960, by thickness of seams mined.

## DOMESTIC PRODUCTION

**TABLE 5.—Growth of the bituminous coal and lignite mining industry in the United States**

| Year | Production (net tons) | Value of production | | Number of mines | Capacity at 280 days (million tons) | Foreign trade [1] | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton | | | Exports (net tons) | Imports (net tons) |
| 1890 | 111,302,322 | $110,420,801 | $.99 | (2) | 137 | 1,272,396 | 1,047,416 |
| 1891 | 117,901,238 | 117,188,400 | .99 | (2) | 148 | 1,651,694 | 1,181,677 |
| 1892 | 126,856,567 | 125,124,381 | .99 | (2) | 162 | 1,904,556 | 1,491,800 |
| 1893 | 128,385,231 | 122,751,618 | .96 | (2) | 174 | 1,986,383 | 1,234,499 |
| 1894 | 118,820,405 | 107,653,501 | .91 | (2) | 196 | 2,439,720 | 1,286,268 |
| 1895 | 135,118,193 | 115,779,771 | .86 | 2,555 | 196 | 2,659,987 | 1,411,323 |
| 1896 | 137,640,276 | 114,891,515 | .83 | 2,599 | 202 | 2,515,838 | 1,393,095 |
| 1897 | 147,617,519 | 119,595,224 | .81 | 2,454 | 213 | 2,670,157 | 1,442,534 |
| 1898 | 166,593,623 | 132,608,713 | .80 | 2,862 | 221 | 3,004,304 | 1,426,108 |
| 1899 | 193,323,187 | 167,952,104 | .87 | 3,245 | 230 | 3,897,994 | 1,409,838 |
| 1900 | 212,316,112 | 220,930,313 | 1.04 | (2) | 255 | 6,060,688 | 1,911,925 |
| 1901 | 225,828,149 | 236,422,049 | 1.05 | (2) | 281 | 6,455,085 | 2,214,507 |
| 1902 | 260,216,844 | 290,858,483 | 1.12 | (2) | 316 | 6,048,777 | 2,174,393 |
| 1903 | 282,749,348 | 351,687,933 | 1.24 | (2) | 350 | 5,835,561 | 4,043,519 |
| 1904 | 278,659,689 | 305,397,001 | 1.10 | 4,650 | 386 | 7,206,879 | 2,179,882 |

**See footnotes at end of table.**

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**TABLE 5.—Growth of the bituminous coal and lignite mining industry in the United States—Continued**

| Year | Production (net tons) | Value of production | | Number of mines | Capacity at 280 days (million tons) | Foreign trade [1] | |
|---|---|---|---|---|---|---|---|
| | | Total | Average per ton | | | Exports (net tons) | Imports (net tons) |
| 1905 | 315,062,785 | 334,658,294 | 1.06 | 5,060 | 417 | 7,512,723 | 1,704,810 |
| 1906 | 342,874,867 | 381,162,115 | 1.11 | 4,430 | 451 | 8,014,263 | 2,039,169 |
| 1907 | 394,759,112 | 451,214,842 | 1.14 | 4,550 | 473 | 9,869,812 | 1,892,653 |
| 1908 | 332,573,944 | 374,135,268 | 1.12 | 4,730 | 482 | 11,071,152 | 2,219,243 |
| 1909 | 379,744,257 | 405,486,777 | 1.07 | 5,775 | 510 | 10,101,131 | 1,375,201 |
| 1910 | 417,111,142 | 469,281,719 | 1.12 | 5,818 | 538 | 11,663,052 | 1,819,766 |
| 1911 | 405,907,059 | 451,375,819 | 1.11 | 5,887 | 538 | 13,259,791 | 1,972,555 |
| 1912 | 450,104,982 | 517,983,445 | 1.15 | 5,747 | 566 | 16,475,029 | 1,456,333 |
| 1913 | 478,435,297 | 565,234,952 | 1.18 | 5,776 | 577 | 18,013,073 | 1,767,656 |
| 1914 | 422,703,970 | 493,309,244 | 1.17 | 5,592 | 608 | 17,589,562 | 1,520,962 |
| 1915 | 442,624,426 | 502,037,688 | 1.13 | 5,502 | 610 | 18,776,640 | 1,703,785 |
| 1916 | 502,519,682 | 665,116,077 | 1.32 | 5,726 | 613 | 21,254,627 | 1,713,837 |
| 1917 | 551,790,563 | 1,249,272,837 | 2.26 | 6,939 | 636 | 23,839,558 | 1,448,453 |
| 1918 | 579,385,920 | 1,491,809,940 | 2.58 | 8,319 | 650 | 22,350,730 | 1,457,073 |
| 1919 | 465,860,058 | 1,160,616,013 | 2.49 | 8,994 | 669 | 20,113,536 | 1,011,550 |
| 1920 | 568,666,683 | 2,129,933,000 | 3.75 | 8,921 | 725 | 38,517,084 | 1,244,990 |
| 1921 | 415,921,950 | 1,199,983,600 | 2.89 | 8,038 | 781 | 23,131,166 | 1,257,589 |
| 1922 | 422,268,099 | 1,274,820,000 | 3.02 | 9,299 | 832 | 12,413,085 | 5,059,999 |
| 1923 | 564,564,662 | 1,514,621,000 | 2.68 | 9,331 | 885 | 21,453,579 | 1,882,306 |
| 1924 | 483,686,538 | 1,062,626,000 | 2.20 | 7,586 | 792 | 17,100,347 | 417,226 |
| 1925 | 520,052,741 | 1,060,402,000 | 2.04 | 7,144 | 748 | 17,461,560 | 601,737 |
| 1926 | 573,366,985 | 1,183,412,000 | 2.06 | 7,177 | 747 | 35,271,937 | 485,666 |
| 1927 | 517,763,352 | 1,029,657,000 | 1.99 | 7,011 | 759 | 18,011,744 | 549,843 |
| 1928 | 500,744,970 | 933,774,000 | 1.86 | 6,450 | 691 | 16,164,485 | 546,526 |
| 1929 | 534,988,593 | 952,781,000 | 1.78 | 6,057 | 679 | 17,429,298 | 495,219 |
| 1930 | 467,526,299 | 795,483,000 | 1.70 | 5,891 | 700 | 15,877,407 | 240,886 |
| 1931 | 382,089,396 | 588,895,000 | 1.54 | 5,642 | 669 | 12,126,299 | 206,303 |
| 1932 | 309,709,872 | 406,677,000 | 1.31 | 5,427 | 594 | 8,814,047 | 186,909 |
| 1933 | 333,630,533 | 445,788,000 | 1.34 | 5,555 | 559 | 9,036,947 | 197,429 |
| 1934 | 359,368,022 | 628,383,000 | 1.75 | 6,258 | 565 | 10,868,552 | 179,661 |
| 1935 | 372,373,122 | 658,063,000 | 1.77 | 6,315 | 582 | 9,742,430 | 201,871 |
| 1936 | 439,087,903 | 770,955,000 | 1.76 | 6,875 | 618 | 10,654,959 | 271,798 |
| 1937 | 445,531,449 | 864,042,000 | 1.94 | 6,548 | 646 | 13,144,678 | 257,996 |
| 1938 | 348,544,764 | 678,653,000 | 1.95 | 5,777 | 602 | 10,490,269 | 241,305 |
| 1939 | 394,855,325 | 728,348,366 | 1.84 | 5,820 | 621 | 11,590,478 | 355,115 |
| 1940 | 460,771,500 | 879,327,227 | 1.91 | 6,324 | 639 | 16,465,928 | 371,571 |
| 1941 | 514,149,245 | 1,125,362,836 | 2.19 | 6,822 | 666 | 20,740,471 | 390,049 |
| 1942 | 582,692,937 | 1,373,990,608 | 2.36 | 6,972 | 663 | 22,943,305 | 498,103 |
| 1943 | 590,177,069 | 1,584,644,477 | 2.69 | 6,620 | 626 | 25,836,208 | 757,634 |
| 1944 | 619,576,240 | 1,810,900,542 | 2.92 | 6,928 | 624 | 26,032,348 | 633,689 |
| 1945 | 577,617,327 | 1,768,204,320 | 3.06 | 7,033 | 620 | 27,956,192 | 467,473 |
| 1946 | 533,922,068 | 1,835,539,476 | 3.44 | 7,333 | 699 | 41,197,378 | 434,680 |
| 1947 | 630,623,722 | 2,622,634,946 | 4.16 | 8,700 | 755 | 68,666,963 | 290,141 |
| 1948 | 599,518,229 | 2,993,267,021 | 4.99 | 9,079 | 774 | 45,930,133 | 291,337 |
| 1949 | 437,869,036 | 2,136,870,571 | 4.88 | 8,559 | 781 | 27,842,056 | 314,980 |
| 1950 | 516,311,053 | 2,500,373,779 | 4.84 | 9,429 | 790 | 25,468,403 | 346,706 |
| 1951 | 533,664,732 | 2,626,030,137 | 4.92 | 8,009 | 736 | 56,721,547 | 292,378 |
| 1952 | 466,840,782 | 2,289,180,401 | 4.90 | 7,275 | 703 | 47,643,150 | 262,268 |
| 1953 | 457,290,449 | 2,247,943,799 | 4.92 | 6,671 | 670 | 33,760,263 | 226,900 |
| 1954 | 391,706,300 | 1,769,619,723 | 4.52 | 6,130 | 603 | 31,040,564 | 198,799 |
| 1955 | 464,633,408 | 2,092,382,737 | 4.50 | 7,856 | 620 | 51,277,256 | 337,145 |
| 1956 | 500,874,077 | 2,412,004,151 | 4.82 | 8,520 | 655 | 68,552,629 | 355,701 |
| 1957 | 492,703,916 | 2,504,406,042 | 5.08 | 8,539 | 680 | 76,445,529 | 366,506 |
| 1958 | 410,445,547 | 1,996,281,274 | 4.86 | 8,264 | 625 | 50,293,382 | 306,940 |
| 1959 | 412,027,502 | 1,965,606,901 | 4.77 | 7,719 | 614 | 37,253,431 | 374,713 |
| 1960 | 415,512,347 | 1,950,425,049 | 4.69 | 7,865 | 609 | 36,541,075 | 260,495 |
| 1961 | 402,976,802 | 1,844,562,662 | 4.58 | 7,648 | 585 | 34,969,825 | 164,259 |
| 1962 | 422,149,325 | 1,891,554,474 | 4.48 | 7,740 | 594 | 38,413,424 | 232,424 |
| 1963 | 458,928,175 | 2,013,309,368 | 4.39 | 7,940 | 627 | 47,078,435 | 267,352 |
| 1964 | 486,997,952 | 2,165,581,847 | 4.45 | 7,630 | 606 | 47,969,423 | 293,059 |

**See footnotes at end of table.**

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**TABLE 5.—Growth of the bituminous coal and lignite mining industry in the United States—Continued**

| Year | Men employed | Average number of days worked | Average days lost per man on strike | Net tons per man— | | Percentage of underground production— | | Percentage of total production— | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Per day | Per year | Cut by machines [3] | Mechanically loaded | Mechanically cleaned [4] | Mined by stripping |
| 1890 | 192,204 | 226 | (2) | 2.56 | 579 | (2) | (2) | (2) | (2) |
| 1891 | 205,803 | 223 | (2) | 2.57 | 573 | 5.3 | (2) | (2) | (2) |
| 1892 | 212,893 | 219 | (2) | 2.72 | 596 | (2) | (2) | (2) | (2) |
| 1893 | 230,365 | 204 | (2) | 2.73 | 557 | (2) | (2) | (2) | (2) |
| 1894 | 244,603 | 171 | (2) | 2.84 | 486 | (2) | (2) | (2) | (2) |
| 1895 | 239,962 | 194 | (2) | 2.90 | 563 | (2) | (2) | (2) | (2) |
| 1896 | 244,171 | 192 | (2) | 2.94 | 564 | 11.9 | (2) | (2) | (2) |
| 1897 | 247,817 | 196 | (2) | 3.04 | 596 | 15.3 | (2) | (2) | (2) |
| 1898 | 255,717 | 211 | (2) | 3.09 | 651 | 19.5 | (2) | (2) | (2) |
| 1899 | 271,027 | 234 | 46 | 3.05 | 713 | 22.7 | (2) | (2) | (2) |
| 1900 | 304,375 | 234 | 43 | 2.98 | 697 | 24.9 | (2) | (2) | (2) |
| 1901 | 340,235 | 225 | 35 | 2.94 | 664 | 25.6 | (2) | (2) | (2) |
| 1902 | 370,056 | 230 | 44 | 3.06 | 703 | 26.8 | (2) | (2) | (2) |
| 1903 | 415,777 | 225 | 28 | 3.02 | 680 | 27.6 | (2) | (2) | (2) |
| 1904 | 437,832 | 202 | 44 | 3.15 | 637 | 28.2 | (2) | (2) | (2) |
| 1905 | 460,629 | 211 | 23 | 3.24 | 684 | 32.8 | (2) | (2) | (2) |
| 1906 | 478,425 | 213 | 63 | 3.36 | 717 | 34.7 | (2) | 2.7 | (2) |
| 1907 | 513,258 | 234 | 14 | 3.29 | 769 | 35.1 | (2) | 2.9 | (2) |
| 1908 | 516,264 | 193 | 38 | 3.34 | 644 | 37.0 | (2) | 3.6 | (2) |
| 1909 | 543,152 | 209 | 29 | 3.34 | 699 | 37.5 | (2) | 3.8 | (2) |
| 1910 | 555,533 | 217 | 89 | 3.46 | 751 | 41.7 | (2) | 3.8 | (2) |
| 1911 | 549,775 | 211 | 27 | 3.50 | 738 | 43.9 | (2) | (2) | (2) |
| 1912 | 548,632 | 223 | 35 | 3.68 | 820 | 46.8 | (2) | 3.9 | (2) |
| 1913 | 571,882 | 232 | 36 | 3.61 | 837 | 50.7 | (2) | 4.6 | (2) |
| 1914 | 583,506 | 195 | 80 | 3.71 | 724 | 51.8 | (2) | 4.8 | 0.3 |
| 1915 | 557,456 | 203 | 61 | 3.91 | 794 | 55.3 | (2) | 4.7 | .6 |
| 1916 | 561,102 | 230 | 26 | 3.90 | 896 | 56.9 | (2) | 4.6 | .8 |
| 1917 | 603,143 | 243 | 17 | 3.77 | 915 | 56.1 | (2) | 4.6 | 1.0 |
| 1918 | 615,305 | 249 | 7 | 3.78 | 942 | 56.7 | (2) | 3.8 | 1.4 |
| 1919 | 621,998 | 195 | 37 | 3.84 | 749 | 60.0 | (2) | 3.6 | 1.2 |
| 1920 | 639,547 | 220 | 22 | 4.00 | 881 | 60.7 | (2) | 3.3 | 1.5 |
| 1921 | 663,754 | 149 | 23 | 4.20 | 627 | 66.4 | (2) | 3.4 | 1.2 |
| 1922 | 687,958 | 142 | 117 | 4.28 | 609 | 64.8 | (2) | (2) | 2.4 |
| 1923 | 704,793 | 179 | 20 | 4.47 | 801 | 68.3 | 0.3 | 3.8 | 2.1 |
| 1924 | 619,604 | 171 | 73 | 4.56 | 781 | 71.5 | .7 | (2) | 2.8 |
| 1925 | 588,493 | 195 | 30 | 4.52 | 884 | 72.9 | 1.2 | (2) | 3.2 |
| 1926 | 593,647 | 215 | 24 | 4.50 | 966 | 73.8 | 1.9 | (2) | 3.0 |
| 1927 | 593,918 | 191 | 153 | 4.55 | 872 | 74.9 | 3.3 | 5.3 | 3.6 |
| 1928 | 522,150 | 203 | 83 | 4.73 | 959 | 76.9 | 4.5 | 5.7 | 4.0 |
| 1929 | 502,993 | 219 | 11 | 4.85 | 1,064 | 78.4 | 7.4 | 6.9 | 3.8 |

**See footnotes at end of table.**

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**TABLE 5.—Growth of the bituminous coal and lignite mining industry in the United States—Continued**

| Year | Men employed | Average number of days worked | Average days lost per man on strike | Net tons per man— | | Percentage of underground production— | | Percentage of total production— | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Per day | Per year | Cut by machines [3] | Mechanically loaded | Mechanically cleaned [4] | Mined by stripping |
| 1890 | 193,202 | 187 | 43 | 5.06 | 948 | 81.0 | 10.5 | 8.3 | 4.3 |
| 1891 | 460,213 | 160 | 35 | 5.30 | 849 | 83.2 | 13.1 | 9.5 | 5.0 |
| 1892 | 406,380 | 146 | 120 | 5.22 | 762 | 84.1 | 12.3 | 9.8 | 6.3 |
| 1893 | 418,703 | 167 | 30 | 4.78 | 797 | 84.7 | 12.0 | 10.4 | 5.5 |
| 1894 | 458,011 | 178 | 15 | 4.40 | 785 | 84.1 | 12.2 | 11.1 | 5.8 |
| 1895 | 462,403 | 179 | [1] 7 | 4.50 | 805 | 84.2 | 13.5 | 12.2 | 6.4 |
| 1896 | 477,204 | 199 | 21 | 4.62 | 920 | 84.8 | 16.3 | 13.9 | 6.4 |
| 1897 | 491,864 | 193 | [1] 19 | 4.69 | 906 | (2) | 20.2 | 14.6 | 7.1 |
| 1898 | 441,333 | 162 | 13 | 4.89 | 790 | 87.5 | 26.7 | 18.2 | 8.7 |
| 1899 | 421,788 | 178 | 36 | 5.25 | 936 | 87.9 | 31.0 | 20.1 | 9.6 |
| 1900 | 439,075 | 202 | 8 | 5.19 | 1,049 | 88.4 | 35.4 | 22.2 | 9.2 |
| 1901 | 456,981 | 216 | 27 | 5.20 | 1,125 | 89.0 | 40.7 | 22.9 | 10.7 |
| 1902 | 461,901 | 246 | 7 | 5.12 | 1,261 | 89.7 | 45.2 | 24.4 | 11.5 |
| 1903 | 416,007 | 264 | [1] 15 | 5.38 | 1,419 | 90.3 | 48.9 | 24.7 | 13.5 |
| 1904 | 393,347 | 278 | [1] 5 | 5.67 | 1,575 | 90.5 | 52.9 | 25.6 | 16.3 |
| 1905 | 393,100 | 261 | [1] 9 | 5.78 | 1,508 | 90.8 | 56.1 | 25.6 | 19.0 |
| 1906 | [1] 396,434 | 214 | [1] 23 | 6.30 | 1,347 | 90.8 | 58.4 | 26.0 | 21.1 |
| 1907 | [1] 419,182 | 234 | [1] 5 | 6.42 | 1,504 | 90.0 | 60.7 | 27.7 | 22.1 |
| 1908 | [1] 441,631 | 217 | [1] 16 | 6.26 | 1,358 | 90.7 | 64.3 | 30.2 | 23.3 |
| 1909 | [1] 433,696 | 157 | [1] 15 | 6.43 | 1,010 | 91.4 | 67.0 | 35.1 | 24.2 |
| 1910 | [1] 415,582 | 183 | [1] 56 | 6.77 | 1,239 | 91.8 | 69.4 | 38.5 | 23.9 |
| 1911 | [1] 372,897 | 203 | [1] 4 | 7.04 | 1,429 | 93.4 | 73.1 | 45.0 | 22.0 |
| 1912 | [1] 335,217 | 186 | [1] 6 | 7.47 | 1,389 | 92.8 | 75.6 | 48.7 | 23.3 |
| 1913 | [1] 298,106 | 191 | [1] 3 | 8.17 | 1,560 | 92.3 | 79.6 | 52.9 | 23.1 |
| 1914 | [1] 227,397 | 182 | [1] 4 | 9.47 | 1,724 | 88.8 | 84.0 | 59.4 | 25.1 |
| 1915 | [1] 225,093 | 210 | [1] 4 | 9.84 | 2,064 | 88.1 | 84.6 | 58.7 | 24.8 |
| 1916 | [1] 228,163 | 214 | [1] 4 | 10.28 | 2,195 | 84.6 | 84.0 | 58.4 | 25.4 |
| 1917 | [1] 228,635 | 203 | [1] 3 | 10.59 | 2,155 | 80.9 | 84.8 | 61.7 | 25.2 |
| 1918 | [1] 197,402 | 184 | [1] 3 | 11.33 | 2,079 | 75.3 | 84.9 | 63.1 | 23.3 |
| 1919 | [1] 179,636 | 188 | [1] 24 | 12.22 | 2,294 | 72.1 | 86.0 | 65.5 | 29.4 |
| 1920 | [1] 169,400 | 191 | [1] 4 | 12.83 | 2,453 | 67.8 | 86.3 | 65.7 | 29.5 |
| 1921 | [1] 180,474 | 193 | [1] 4 | 13.87 | 2,678 | 64.7 | 86.3 | 65.7 | 30.3 |
| 1922 | [1] 143,822 | 199 | [1] 6 | 14.72 | 2,935 | 63.3 | 85.7 | 64.3 | 30.9 |
| 1923 | [1] 141,646 | 205 | [1] 6 | 15.83 | 3,240 | 61.0 | 85.8 | 63.1 | 31.4 |
| 1924 | [1] 128,698 | 225 | [1] 6 | 16.84 | 3,784 | 57.4 | 87.4 | 63.7 | 31.2 |

[1] Figures for 1890–1914 represent fiscal year ended June 30. [2] Data not available.
[3] Percentages for 1890–1913 are of total production, as a separation of underground and strip production is not available for these years. Exclusive of continuous mining which began in 1948.
[4] Percentages for 1906–26 are exclusive of coal cleaned at central washeries operated by consumers.
[5] Bureau of Labor Statistics, U.S. Department of Labor.
[6] Average number of men working daily.

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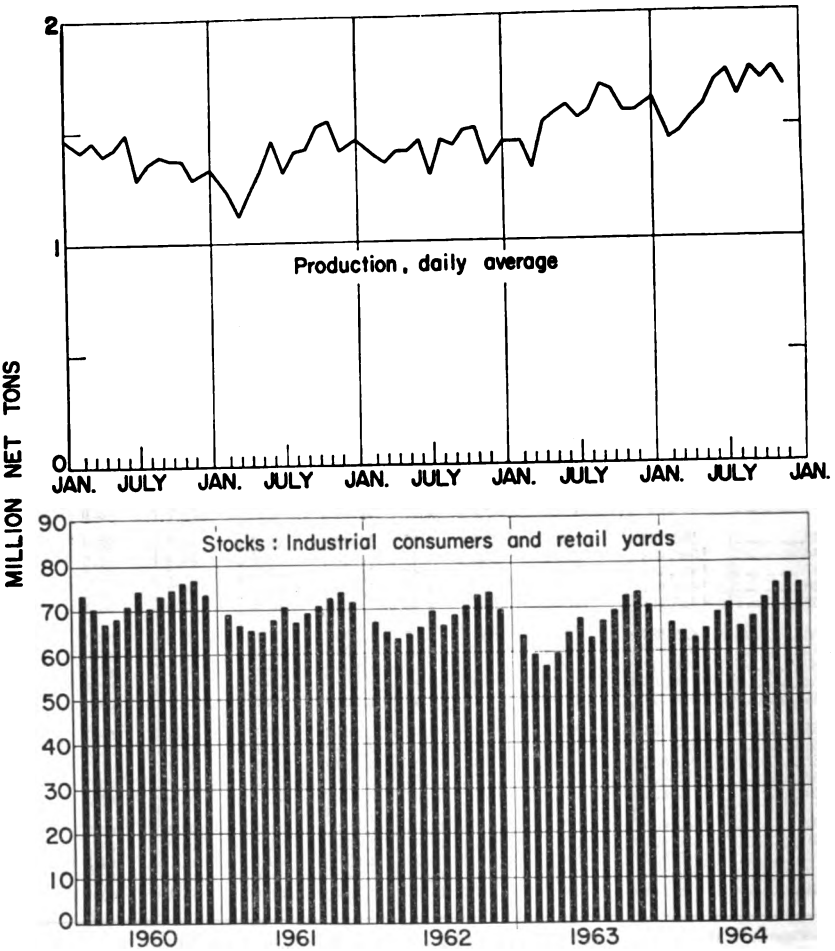


FIGURE 2.—Trends of production and stocks of bituminous coal and lignite in the United States, 1960–64.

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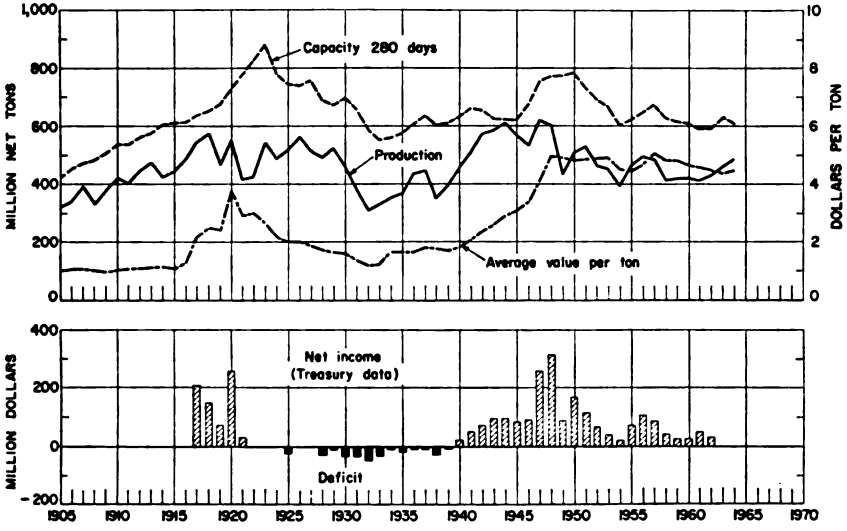


FIGURE 3.—Trends of bituminous coal and lignite production, realization, mine capacity, and net income or deficit in the United States, 1905–64.

## PRODUCTION BY MONTHS AND WEEKS

The figures on monthly and weekly production are estimates based upon railroad carloadings of coal reported daily and weekly by all important carriers, shipments on the Allegheny and Monongahela Rivers reported by the U.S. Army Engineers, direct reports from mining companies, and monthly production statements compiled by certain local operators associations and State mine departments. In computing the estimates, allowance is made for commercial truck shipments, local sales, colliery fuel, and small truck mines producing over 1,000 tons a year.

Preliminary estimates are made currently and published in the Weekly Coal Reports. These preliminary estimates have proved very reliable and for many years have been within approximately 1 percent of the final figure of total production, based upon complete coverage of all mines producing over 1,000 tons a year. The preliminary estimates are later revised to agree with the final total production based on the canvass. Thus, the monthly and weekly estimates of production, summarized in tables 6 to 9, represent final figures and vary slightly from the preliminary figures of production published in the Weekly Coal Reports.

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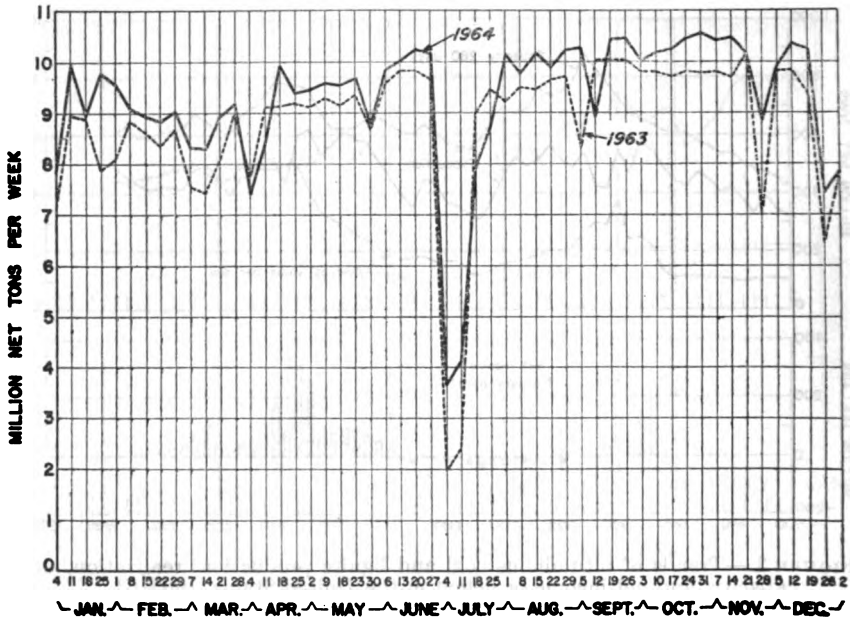


FIGURE 4.—Production of bituminous coal and lignite in the United States, 1963–64, by weeks.

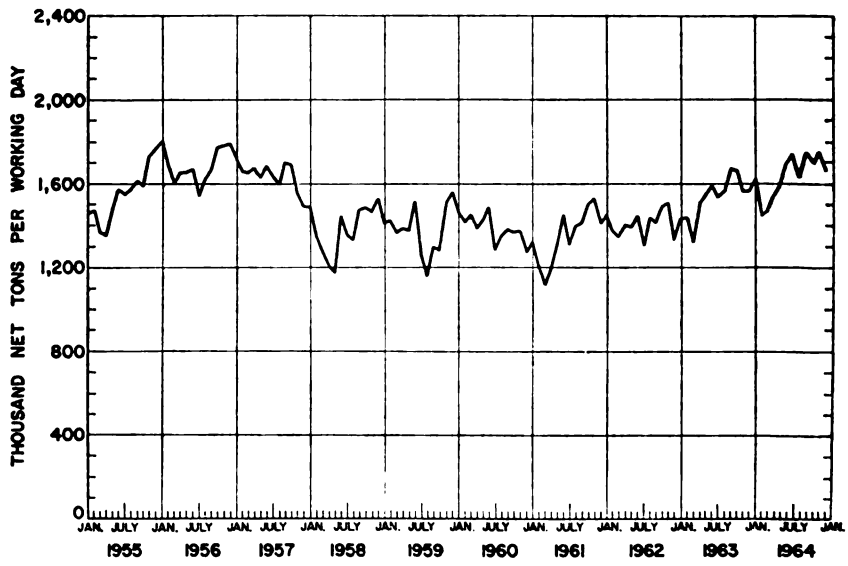


FIGURE 5.—Average production of bituminous coal and lignite in the United States, per working day in each month, 1955–64.

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**TABLE 6.—Production of bituminous coal and lignite in the United States, with estimates by months**

| Month | Production (thousand net tons) | | Maximum number of working days | | Average production per working day (thousand net tons) | |
|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| January | 37,801 | 42,152 | 26 | 26 | 1,435 | 1,621 |
| February | 34,493 | 36,153 | 24 | 25 | 1,437 | 1,446 |
| March | 34,086 | 38,217 | 26 | 26 | 1,311 | 1,470 |
| April | 38,579 | 39,005 | 25.4 | 25.4 | 1,519 | 1,536 |
| May | 41,556 | 39,730 | 26.6 | 25 | 1,562 | 1,589 |
| June | 39,458 | 42,068 | 24.7 | 24.8 | 1,597 | 1,696 |
| July | 28,070 | 32,349 | 18.8 | 18.6 | 1,534 | 1,739 |
| August | 42,299 | 42,409 | 27 | 26 | 1,567 | 1,631 |
| September | 40,320 | 43,752 | 24 | 25 | 1,680 | 1,750 |
| October | 44,576 | 45,922 | 27 | 27 | 1,662 | 1,701 |
| November | 38,820 | 41,877 | 24.9 | 23.9 | 1,559 | 1,752 |
| December | 39,070 | 43,364 | 25 | 26 | 1,563 | 1,668 |
| Total | 458,928 | 486,998 | 298.9 | 298.7 | 1,535 | 1,630 |

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**TABLE 7.—Production of bituminous coal and lignite in the United States, 1964, by States, with estimates by months**

**(Thousand net tons)**

| State | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 1,258 | 1,211 | 1,337 | 1,244 | 1,002 | 1,311 | 862 | 1,260 | 1,186 | 1,258 | 1,212 | 1,294 | 14,435 |
| Alaska | 84 | 75 | 76 | 60 | 39 | 48 | 45 | 58 | 49 | 61 | 69 | 81 | 745 |
| Arkansas | 24 | 20 | 20 | 20 | 19 | 21 | 14 | 18 | 15 | 14 | 13 | 14 | 212 |
| Colorado | 449 | 361 | 314 | 282 | 296 | 332 | 217 | 310 | 367 | 427 | 442 | 558 | 4,355 |
| Georgia | 1 | 1 | 1 | | | | | | | | | 1 | 4 |
| Illinois | 4,942 | 4,263 | 4,596 | 4,438 | 4,338 | 4,564 | 3,217 | 4,732 | 4,844 | 5,245 | 4,703 | 5,141 | 55,023 |
| Indiana | 1,612 | 1,324 | 1,341 | 1,195 | 1,139 | 1,185 | 825 | 1,132 | 1,213 | 1,413 | 1,228 | 1,468 | 15,075 |
| Iowa | 97 | 67 | 39 | 82 | 60 | 76 | 82 | 77 | 83 | 66 | 104 | 140 | 973 |
| Kansas | 91 | 92 | 102 | 90 | 107 | 85 | 73 | 139 | 147 | 142 | 87 | 108 | 1,263 |
| Kentucky: | | | | | | | | | | | | | |
| Eastern | 3,861 | 2,975 | 3,348 | 3,712 | 3,670 | 3,866 | 3,194 | 3,992 | 4,171 | 4,366 | 3,920 | 3,816 | 44,891 |
| Western | 3,457 | 2,894 | 2,796 | 2,923 | 3,170 | 3,241 | 2,525 | 3,402 | 3,531 | 3,558 | 3,063 | 3,296 | 37,856 |
| Total Kentucky | 7,318 | 5,869 | 6,144 | 6,635 | 6,840 | 7,107 | 5,719 | 7,394 | 7,702 | 7,924 | 6,983 | 7,112 | 82,747 |
| Maryland | 87 | 95 | 92 | 93 | 78 | 87 | 94 | 103 | 93 | 102 | 100 | 112 | 1,136 |
| Missouri | 363 | 272 | 218 | 195 | 246 | 303 | 227 | 270 | 266 | 268 | 305 | 321 | 3,254 |
| Montana: | | | | | | | | | | | | | |
| Bituminous | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 5 | 46 |
| Lignite | 25 | 18 | 23 | 21 | 24 | 29 | 26 | 23 | 18 | 29 | 28 | 36 | 300 |
| Total Montana | 29 | 21 | 27 | 24 | 28 | 33 | 30 | 27 | 21 | 33 | 32 | 41 | 346 |
| New Mexico | 244 | 236 | 282 | 277 | 247 | 271 | 125 | 242 | 264 | 283 | 250 | 248 | 2,969 |
| North Dakota (lignite) | 308 | 232 | 221 | 168 | 146 | 138 | 175 | 161 | 198 | 248 | 263 | 379 | 2,637 |
| Ohio | 2,727 | 2,319 | 2,467 | 2,985 | 3,263 | 3,664 | 3,091 | 3,353 | 3,565 | 3,566 | 3,449 | 2,861 | 37,310 |
| Oklahoma | 87 | 68 | 79 | 95 | 88 | 101 | 85 | 77 | 84 | 88 | 75 | 101 | 1,028 |
| Pennsylvania | 6,518 | 6,114 | 5,996 | 5,849 | 6,229 | 6,388 | 5,091 | 6,608 | 6,786 | 7,231 | 6,733 | 6,988 | 76,531 |
| South Dakota (lignite) | 3 | 2 | 2 | 1 | | | | | | 1 | 2 | 2 | 13 |
| Tennessee | 515 | 445 | 528 | 495 | 512 | 526 | 487 | 537 | 500 | 511 | 458 | 476 | 5,990 |
| Utah | 465 | 417 | 439 | 367 | 388 | 364 | 200 | 356 | 426 | 403 | 414 | 481 | 4,720 |
| Virginia | 2,823 | 2,365 | 2,542 | 2,544 | 2,661 | 2,805 | 2,339 | 2,736 | 2,752 | 2,830 | 2,539 | 2,718 | 31,654 |
| Washington | 10 | 8 | 5 | 4 | 4 | 3 | 2 | 3 | 4 | 5 | 7 | 13 | 68 |
| West Virginia | 11,670 | 10,016 | 11,112 | 11,679 | 11,848 | 12,507 | 9,172 | 12,635 | 12,942 | 13,470 | 12,082 | 12,276 | 141,409 |
| Wyoming | 427 | 260 | 237 | 183 | 152 | 149 | 177 | 181 | 245 | 333 | 327 | 430 | 3,101 |
| Total | 42,152 | 36,153 | 38,217 | 39,005 | 39,730 | 42,068 | 32,349 | 42,409 | 43,752 | 45,922 | 41,877 | 43,364 | 486,998 |

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**TABLE 8.—Production of bituminous coal and lignite in the United States, 1964, by districts, with estimates by months**

(Thousand net tons)

| District | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Eastern Pennsylvania | 3,224 | 3,030 | 2,979 | 2,916 | 3,085 | 3,173 | 2,553 | 3,293 | 3,369 | 3,589 | 3,345 | 3,476 | 38,032 |
| 2. Western Pennsylvania | 3,476 | 3,260 | 3,197 | 3,119 | 3,322 | 3,406 | 2,715 | 3,524 | 3,618 | 3,856 | 3,590 | 3,726 | 40,809 |
| 3. Northern West Virginia | 3,556 | 3,055 | 3,322 | 3,500 | 3,778 | 3,928 | 3,111 | 3,988 | 4,072 | 4,231 | 3,819 | 3,843 | 44,203 |
| 4. Ohio | 2,727 | 2,319 | 2,467 | 2,985 | 3,263 | 3,664 | 3,091 | 3,353 | 3,565 | 3,566 | 3,449 | 2,861 | 37,310 |
| 5. Michigan | | | | | | | | | | | | | |
| 6. Panhandle | 427 | 368 | 400 | 421 | 455 | 472 | 374 | 480 | 490 | 509 | 459 | 462 | 5,317 |
| 7. Southern Numbered 1 | 3,271 | 2,799 | 3,128 | 3,270 | 3,224 | 3,430 | 2,441 | 3,446 | 3,530 | 3,674 | 3,285 | 3,368 | 38,866 |
| 8. Southern Numbered 2 | 11,409 | 9,402 | 10,479 | 11,040 | 11,024 | 11,657 | 9,078 | 11,765 | 12,058 | 12,541 | 11,236 | 11,409 | 133,098 |
| 9. West Kentucky | 3,457 | 2,894 | 2,796 | 2,923 | 3,170 | 3,241 | 2,525 | 3,402 | 3,531 | 3,558 | 3,063 | 3,296 | 37,856 |
| 10. Illinois | 4,942 | 4,263 | 4,596 | 4,438 | 4,338 | 4,564 | 3,217 | 4,732 | 4,844 | 5,245 | 4,703 | 5,141 | 55,023 |
| 11. Indiana | 1,612 | 1,324 | 1,341 | 1,195 | 1,139 | 1,185 | 825 | 1,132 | 1,213 | 1,413 | 1,228 | 1,468 | 15,075 |
| 12. Iowa | 97 | 67 | 39 | 82 | 60 | 76 | 82 | 77 | 83 | 66 | 104 | 140 | 973 |
| 13. Southeastern | 1,370 | 1,308 | 1,451 | 1,350 | 1,112 | 1,424 | 967 | 1,375 | 1,293 | 1,368 | 1,310 | 1,397 | 15,725 |
| 14. Arkansas-Oklahoma | 61 | 49 | 53 | 60 | 56 | 64 | 50 | 51 | 51 | 51 | 45 | 57 | 648 |
| 15. Southwestern | 504 | 403 | 366 | 340 | 404 | 446 | 349 | 453 | 461 | 461 | 435 | 487 | 5,109 |
| 16. Northern Colorado | 113 | 78 | 61 | 38 | 33 | 37 | 14 | 41 | 59 | 87 | 83 | 122 | 766 |
| 17. Southern Colorado | 369 | 315 | 291 | 281 | 296 | 332 | 220 | 302 | 344 | 378 | 393 | 470 | 3,991 |
| 18. New Mexico | 211 | 204 | 244 | 240 | 214 | 234 | 108 | 209 | 228 | 245 | 216 | 214 | 2,567 |
| 19. Wyoming | 427 | 260 | 237 | 183 | 152 | 149 | 177 | 181 | 245 | 333 | 327 | 430 | 3,101 |
| 20. Utah | 465 | 417 | 439 | 367 | 388 | 364 | 200 | 356 | 426 | 403 | 414 | 481 | 4,720 |
| 21. North-South Dakota | 311 | 234 | 223 | 169 | 146 | 138 | 175 | 161 | 198 | 249 | 265 | 381 | 2,650 |
| 22. Montana | 29 | 21 | 27 | 24 | 28 | 33 | 30 | 27 | 21 | 33 | 32 | 41 | 346 |
| 23. Washington | 94 | 83 | 81 | 64 | 43 | 51 | 47 | 61 | 53 | 66 | 76 | 94 | 813 |
| Total | 42,152 | 36,153 | 38,217 | 39,005 | 39,730 | 42,068 | 32,349 | 42,409 | 43,752 | 45,922 | 41,877 | 43,364 | 486,998 |

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**TABLE 9.—Production of bituminous coal and lignite in the United States, with estimates by weeks**

| 1963 | | | | 1964 | | | |
|---|---|---|---|---|---|---|---|
| Week ended— | Production (thousand net tons) | Maximum number of working days | Average production per working day (thousand net tons | Week ended— | Production (thousand net tons) | Maximum number of working days | Average production per working day (thousand net tons) |
| Jan. 5 | [1] 5,632 | [1] 4 | [2] 1,420 | Jan. 4 | [1] 4,260 | [1] 3 | [2] 1,570 |
| Jan. 12 | 8,941 | 6 | 1,490 | Jan. 11 | 9,942 | 6 | 1,657 |
| Jan. 19 | 8,836 | 6 | 1,473 | Jan. 18 | 8,956 | 6 | 1,493 |
| Jan. 26 | 7,852 | 6 | 1,309 | Jan. 25 | 9,771 | 6 | 1,629 |
| Feb. 2 | 8,125 | 6 | 1,354 | Feb. 1 | 9,550 | 6 | 1,592 |
| Feb. 9 | 8,855 | 6 | 1,476 | Feb. 8 | 9,073 | 6 | 1,512 |
| Feb. 16 | 8,553 | 6 | 1,426 | Feb. 15 | 8,918 | 6 | 1,486 |
| Feb. 23 | 8,297 | 6 | 1,383 | Feb. 22 | 8,821 | 6 | 1,470 |
| Mar. 2 | 8,709 | 6 | 1,452 | Feb. 29 | 9,014 | 6 | 1,502 |
| Mar. 9 | 7,548 | 6 | 1,258 | Mar. 7 | 8,328 | 6 | 1,388 |
| Mar. 16 | 7,431 | 6 | 1,239 | Mar. 14 | 8,307 | 6 | 1,385 |
| Mar. 23 | 8,116 | 6 | 1,353 | Mar. 21 | 8,950 | 6 | 1,492 |
| Mar. 30 | 8,985 | 6 | 1,498 | Mar. 28 | 9,199 | 6 | 1,533 |
| Apr. 6 | 7,716 | 5.4 | 1,429 | Apr. 4 | 7,412 | 5.4 | 1,373 |
| Apr. 13 | 9,123 | 6 | 1,521 | Apr. 11 | 8,390 | 6 | 1,398 |
| Apr. 20 | 9,119 | 6 | 1,520 | Apr. 18 | 9,944 | 6 | 1,657 |
| Apr. 27 | 9,191 | 6 | 1,532 | Apr. 25 | 9,389 | 6 | 1,565 |
| May 4 | 9,097 | 6 | 1,516 | May 2 | 9,461 | 6 | 1,577 |
| May 11 | 9,308 | 6 | 1,551 | May 9 | 9,588 | 6 | 1,598 |
| May 18 | 9,127 | 6 | 1,521 | May 16 | 9,551 | 6 | 1,592 |
| May 25 | 9,353 | 6 | 1,559 | May 23 | 9,667 | 6 | 1,611 |
| June 1 | 8,609 | 5.6 | 1,537 | May 30 | 8,766 | 5 | 1,753 |
| June 8 | 9,550 | 6 | 1,592 | June 6 | 9,847 | 6 | 1,641 |
| June 15 | 9,858 | 6 | 1,643 | June 13 | 10,009 | 6 | 1,668 |
| June 22 | 9,871 | 6 | 1,645 | June 20 | 10,247 | 6 | 1,708 |
| June 29 | 9,671 | 5.7 | 1,697 | June 27 | 10,174 | 5.9 | 1,724 |
| July 6 | 1,958 | 1 | 1,958 | July 4 | 3,658 | 1.9 | 1,925 |
| July 13 | 2,431 | 2.3 | 1,057 | July 11 | 4,108 | 2.2 | 1,867 |
| July 20 | 8,947 | 6 | 1,491 | July 18 | 7,957 | 4.4 | 1,808 |
| July 27 | 9,475 | 6 | 1,579 | July 25 | 8,689 | 6 | 1,448 |
| Aug. 3 | 9,214 | 6 | 1,536 | Aug. 1 | 10,155 | 6 | 1,693 |
| Aug. 10 | 9,521 | 6 | 1,587 | Aug. 8 | 9,766 | 6 | 1,628 |
| Aug. 17 | 9,465 | 6 | 1,578 | Aug. 15 | 10,178 | 6 | 1,696 |
| Aug. 24 | 9,625 | 6 | 1,604 | Aug. 22 | 9,882 | 6 | 1,647 |
| Aug. 31 | 9,733 | 6 | 1,622 | Aug. 29 | 10,238 | 6 | 1,706 |
| Sept. 7 | 8,231 | 5 | 1,646 | Sept. 5 | 10,269 | 6 | 1,712 |
| Sept. 14 | 10,055 | 6 | 1,676 | Sept. 12 | 8,927 | 5 | 1,785 |
| Sept. 21 | 10,042 | 6 | 1,674 | Sept. 19 | 10,445 | 6 | 1,741 |
| Sept. 28 | 10,037 | 6 | 1,673 | Sept. 26 | 10,468 | 6 | 1,745 |
| Oct. 5 | 9,812 | 6 | 1,635 | Oct. 3 | 10,013 | 6 | 1,669 |
| Oct. 12 | 9,819 | 6 | 1,637 | Oct. 10 | 10,183 | 6 | 1,697 |
| Oct. 19 | 9,710 | 6 | 1,618 | Oct. 17 | 10,248 | 6 | 1,708 |
| Oct. 26 | 9,812 | 6 | 1,635 | Oct. 24 | 10,470 | 6 | 1,745 |
| Nov. 2 | 9,770 | 6 | 1,628 | Oct. 31 | 10,569 | 6 | 1,762 |
| Nov. 9 | 9,808 | 6 | 1,635 | Nov. 7 | 10,422 | 6 | 1,737 |
| Nov. 16 | 9,705 | 5.9 | 1,645 | Nov. 14 | 10,495 | 5.9 | 1,779 |
| Nov. 23 | 10,167 | 6 | 1,695 | Nov. 21 | 10,146 | 6 | 1,691 |
| Nov. 30 | 7,048 | 5 | 1,410 | Nov. 28 | 8,846 | 5 | 1,769 |
| Dec. 7 | 9,854 | 6 | 1,642 | Dec. 5 | 9,924 | 6 | 1,654 |
| Dec. 14 | 9,852 | 6 | 1,642 | Dec. 12 | 10,370 | 6 | 1,728 |
| Dec. 21 | 9,325 | 6 | 1,554 | Dec. 19 | 10,248 | 6 | 1,708 |
| Dec. 28 | 6,449 | 5 | 1,290 | Dec. 26 | 7,435 | 5 | 1,487 |
| Jan. 4 | [1] 3,590 | [1] 2 | [2] 1,570 | Jan. 2 | [1] 7,355 | [1] 4 | [2] 1,570 |
| Total | 458,928 | 298.9 | 1,535 | Total | 486,998 | 298.7 | 1,630 |

[1] Figures represent output and number of working days in that part of week included in calendar year shown. Total production for the week ending January 5, 1963, was 7,100,000 net tons and for the week ending January 2, 1965, was 7,850,000 net tons.

[2] Average daily output for the entire week and not for working days in the calendar year shown.

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## SUMMARY BY STATES

**TABLE 10.—Bituminous coal and lignite produced in the United States, by States, with production of maximum year and cumulative production from earliest record to end of 1964**

(Thousand net tons)

| State | Maximum production | | Production, by years | | | | | | | | | | Total production from earliest record to end of 1964 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | Quantity | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | |
| Alabama | 1926 | 21,001 | 13,088 | 12,663 | 13,260 | 11,182 | 11,947 | 13,011 | 12,915 | 12,880 | 12,359 | 14,435 | 1,012,234 |
| Arkansas | 1907 | 2,670 | 573 | 590 | 508 | 364 | 441 | 409 | 395 | 256 | 221 | 212 | 99,751 |
| Colorado | 1917 | 12,483 | 3,568 | 3,502 | 3,594 | 2,974 | 3,294 | 3,607 | 3,678 | 3,379 | 3,690 | 4,355 | 525,222 |
| Illinois | 1918 | 89,291 | 45,932 | 48,102 | 46,903 | 43,912 | 45,466 | 45,977 | 45,246 | 48,487 | 51,736 | 55,023 | 3,852,419 |
| Indiana | 1918 | 30,679 | 16,149 | 17,089 | 15,841 | 15,022 | 14,804 | 15,538 | 15,106 | 15,709 | 15,100 | 15,075 | 1,225,691 |
| Iowa | 1917 | 8,966 | 1,258 | 1,358 | 1,312 | 1,179 | 1,180 | 1,068 | 927 | 1,130 | 1,213 | 973 | 356,818 |
| Kansas | 1918 | 7,562 | 742 | 884 | 749 | 823 | 772 | 888 | 664 | 915 | 1,169 | 1,263 | 284,122 |
| Kentucky | 1947 | 84,241 | 69,020 | 74,555 | 74,667 | 66,312 | 62,810 | 66,847 | 63,032 | 69,212 | 77,350 | 82,747 | 3,003,931 |
| Maryland | 1907 | 5,533 | 512 | 669 | 748 | 838 | 842 | 748 | 757 | 821 | 1,162 | 1,136 | 270,835 |
| Missouri | 1917 | 5,671 | 3,232 | 3,283 | 2,976 | 2,592 | 2,748 | 2,890 | 2,038 | 2,896 | 3,174 | 3,254 | 301,545 |
| Montana | 1944 | 4,844 | 1,247 | 846 | 413 | 305 | 345 | 313 | 371 | 382 | 343 | 346 | 172,473 |
| New Mexico | 1918 | 4,023 | 201 | 158 | 137 | 117 | 148 | 295 | 412 | 677 | 1,945 | 2,969 | 131,406 |
| North Dakota | 1950 | 3,261 | 3,102 | 2,815 | 2,561 | 2,314 | 2,413 | 2,525 | 2,726 | 2,733 | 2,399 | 2,637 | 106,137 |
| Ohio | 1920 | 45,878 | 37,870 | 38,934 | 36,862 | 32,028 | 35,112 | 33,957 | 32,226 | 34,125 | 36,790 | 37,310 | 2,232,021 |
| Oklahoma | 1920 | 4,849 | 2,164 | 2,007 | 2,195 | 1,630 | 1,525 | 1,342 | 1,031 | 1,048 | 1,008 | 1,028 | 184,931 |
| Pennsylvania | 1918 | 178,551 | 85,713 | 90,287 | 85,365 | 67,771 | 65,347 | 65,425 | 62,652 | 65,315 | 71,501 | 76,531 | 8,570,254 |
| Tennessee | 1956 | 8,848 | 7,053 | 8,848 | 7,955 | 6,785 | 5,913 | 5,931 | 5,860 | 6,213 | 6,121 | 5,990 | 418,613 |
| Utah | 1947 | 7,429 | 6,296 | 6,522 | 6,858 | 5,328 | 4,545 | 4,955 | 5,159 | 4,297 | 4,360 | 4,720 | 281,404 |
| Virginia | 1964 | 31,654 | 23,508 | 28,063 | 29,506 | 26,826 | 29,709 | 27,838 | 30,332 | 29,474 | 30,531 | 31,654 | 937,776 |
| Washington | 1918 | 4,082 | 610 | 473 | 360 | 252 | 242 | 228 | 191 | 235 | 190 | 68 | 149,182 |
| West Virginia | 1947 | 176,157 | 139,168 | 155,891 | 156,842 | 119,468 | 119,692 | 118,944 | 113,071 | 118,499 | 132,568 | 141,409 | 6,976,535 |
| Wyoming | 1945 | 9,847 | 2,927 | 2,553 | 2,117 | 1,629 | 1,977 | 2,024 | 2,529 | 2,569 | 3,124 | 3,101 | 414,953 |
| Other States[1] | | | 695 | 782 | 885 | 795 | 696 | 752 | 759 | 897 | 874 | 762 | 188,814 |
| Total | 1947 | 630,624 | 464,633 | 500,874 | 492,704 | 410,446 | 412,028 | 415,512 | 402,977 | 422,149 | 458,928 | 486,998 | 31,697,067 |

[1] Production, if any, in Alaska, Arizona, California, Georgia, Idaho, Michigan, North Carolina, Oregon, South Dakota, Texas, and North Dakota in 1954 included in "Other States."



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**TABLE 11.—Number of mines, production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1964, by States**

| State | Production (net tons) | | | | | Average value per ton[3] | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number of active mines | Shipped by rail or water[1] | Shipped by truck | Used at mine[2] | Total | | | | | |
| Alabama | 175 | 11,883,501 | 1,900,475 | 651,478 | 14,435,454 | $6.83 | 5,421 | 219 | 1,187,345 | 12.16 |
| Alaska | 5 | 725,862 | 12,003 | 7,077 | 744,942 | 6.72 | 177 | 267 | 47,208 | 15.78 |
| Arkansas | 11 | 210,335 | 1,980 | | 212,315 | 7.08 | 107 | 189 | 20,245 | 10.49 |
| Colorado | 82 | 3,389,394 | 870,097 | 95,754 | 4,355,245 | 5.38 | 1,713 | 191 | 327,636 | 13.29 |
| Georgia | 1 | | 3,900 | | 3,900 | 3.82 | 13 | 111 | 1,444 | 2.70 |
| Illinois | 102 | 49,639,963 | 5,280,203 | 102,436 | 55,022,602 | 3.79 | 8,172 | 248 | 2,028,357 | 27.13 |
| Indiana | 60 | 11,109,793 | 2,543,966 | 1,420,872 | 15,074,631 | 3.80 | 2,568 | 216 | 555,016 | 27.16 |
| Iowa | 34 | 664,466 | 307,805 | 943 | 973,214 | 3.54 | 351 | 214 | 75,171 | 12.95 |
| Kansas | 7 | 960,232 | 299,324 | 3,853 | 1,263,409 | 4.55 | 248 | 248 | 61,424 | 20.57 |
| Kentucky | 2,002 | 68,177,805 | 14,507,708 | 61,658 | 82,747,171 | 3.75 | 22,590 | 199 | 4,496,735 | 18.40 |
| Maryland | 67 | 619,573 | 516,245 | 18 | 1,135,836 | 3.97 | 316 | 236 | 74,503 | 15.25 |
| Missouri | 20 | 1,777,112 | 438,343 | 1,037,975 | 3,253,430 | 4.08 | 466 | 236 | 110,156 | 29.53 |
| Montana: | | | | | | | | | | |
| Bituminous | 9 | 4,125 | 41,547 | 234 | 45,906 | 7.40 | 61 | 123 | 7,532 | 6.09 |
| Lignite | 4 | 293,117 | 6,819 | 5 | 299,941 | 1.95 | 29 | 198 | 5,747 | 52.19 |
| Total Montana | 13 | 297,242 | 48,366 | 239 | 345,847 | 2.68 | 90 | 148 | 13,279 | 26.04 |
| New Mexico | 11 | 835,038 | 2,134,032 | 402 | 2,969,472 | 3.29 | 307 | 219 | 67,217 | 44.18 |
| North Dakota (lignite) | 29 | 2,013,298 | 336,261 | 287,192 | 2,636,751 | 2.15 | 280 | 199 | 55,799 | 47.25 |
| Ohio | 420 | 22,607,438 | 10,802,625 | 3,900,314 | 37,310,377 | 3.69 | 8,421 | 239 | 2,013,972 | 18.53 |
| Oklahoma | 16 | 997,991 | 30,005 | | 1,027,996 | 5.32 | 247 | 225 | 55,570 | 18.50 |
| Pennsylvania | 1,123 | 60,634,342 | 14,328,401 | 1,568,015 | 76,530,758 | 5.07 | 23,349 | 227 | 5,304,866 | 14.43 |
| South Dakota (lignite) | 1 | | 12,700 | 300 | 13,000 | 4.85 | 8 | 163 | 1,300 | 10.00 |
| Tennessee | 253 | 4,102,596 | 1,884,204 | 3,605 | 5,990,405 | 3.79 | 3,032 | 195 | 590,120 | 10.15 |
| Utah | 35 | 4,207,483 | 484,380 | 27,980 | 4,719,843 | 7.03 | 1,679 | 201 | 337,576 | 13.98 |
| Virginia | 1,398 | 27,332,367 | 4,104,078 | 217,039 | 31,653,484 | 3.89 | 9,358 | 233 | 2,177,216 | 14.54 |
| Washington | 5 | 18,696 | 49,362 | | 68,058 | 8.45 | 76 | 162 | 12,296 | 5.53 |
| West Virginia | 1,743 | 134,929,125 | 3,579,536 | 2,899,837 | 141,408,498 | 4.90 | 39,308 | 235 | 9,234,723 | 15.31 |
| Wyoming | 17 | 1,591,676 | 1,056,392 | 453,246 | 3,101,314 | 3.15 | 401 | 170 | 68,154 | 45.50 |
| Total | 7,630 | 408,725,328 | 65,532,391 | 12,740,233 | 486,997,952 | 4.45 | 128,698 | 225 | 28,917,328 | 16.84 |

[1] Includes coal loaded at mine directly into railroad cars or river barges, hauled by trucks to railroad sidings, and hauled by trucks to waterways.

[2] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.

[3] Value received or charged for coal, f.o.b. mine. Includes a value, estimated by producer, for coal not sold.

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**TABLE 12.—Number of mines, production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1964, by districts**

| District | Production (net tons) | | | | | Average value per ton[3] | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|---|---|---|---|
| | Number of active mines | Shipped by rail or water[1] | Shipped by truck | Used at mine[2] | Total | | | | | |
| 1. Eastern Pennsylvania | 851 | 30,023,618 | 7,084,869 | 923,158 | 38,031,645 | $4.36 | 12,085 | 223 | 2,699,675 | 14.09 |
| 2. Western Pennsylvania | 358 | 32,332,218 | 7,831,522 | 644,939 | 40,808,679 | 5.68 | 12,078 | 230 | 2,781,585 | 14.67 |
| 3. Northern West Virginia | 511 | 43,060,747 | 1,097,733 | 44,570 | 44,203,050 | 4.62 | 11,290 | 235 | 2,654,201 | 16.65 |
| 4. Ohio | 420 | 22,607,438 | 10,802,625 | 3,900,314 | 37,310,377 | 3.69 | 8,421 | 239 | 2,013,972 | 18.53 |
| 5. Michigan | 20 | 2,325,096 | 450,007 | 2,541,648 | 5,316,751 | 4.35 | 1,130 | 247 | 278,940 | 19.06 |
| 6. Panhandle | 815 | 37,263,568 | 1,431,630 | 171,103 | 38,866,301 | 5.82 | 12,463 | 237 | 2,955,366 | 13.15 |
| 7. Southern Numbered 1 | 3,856 | 116,820,589 | 15,860,582 | 416,838 | 133,098,009 | 4.22 | 43,731 | 213 | 9,302,864 | 14.31 |
| 8. Southern Numbered 2 | 99 | 33,025,444 | 4,822,479 | 7,896 | 37,855,819 | 3.29 | 4,551 | 242 | 1,099,369 | 34.43 |
| 9. West Kentucky | 102 | 49,639,963 | 5,280,203 | 102,436 | 55,022,602 | 3.79 | 8,172 | 248 | 2,028,357 | 27.13 |
| 10. Illinois | 60 | 11,109,793 | 2,543,966 | 1,420,872 | 15,074,631 | 3.80 | 2,568 | 216 | 555,016 | 27.16 |
| 11. Indiana | 34 | 664,466 | 307,805 | 943 | 973,214 | 3.54 | 351 | 214 | 75,171 | 12.95 |
| 12. Iowa | 252 | 12,828,029 | 2,245,725 | 651,498 | 15,725,252 | 6.61 | 6,059 | 214 | 1,294,952 | 12.14 |
| 13. Southeastern | 17 | 643,297 | 4,773 | | 648,070 | 7.20 | 214 | 194 | 41,535 | 15.60 |
| 14. Arkansas-Oklahoma | 37 | 3,302,373 | 764,879 | 1,041,828 | 5,109,080 | 4.18 | 854 | 241 | 205,860 | 24.82 |
| 15. Southwestern | 7 | 517,019 | 242,857 | 6,712 | 766,588 | 4.13 | 309 | 194 | 59,868 | 12.80 |
| 16. Northern Colorado | 78 | 3,269,547 | 631,903 | 89,444 | 3,990,894 | 5.99 | 1,535 | 191 | 293,454 | 13.60 |
| 17. Southern Colorado | 8 | 437,866 | 2,129,369 | | 2,567,235 | 2.38 | 176 | 236 | 41,531 | 61.81 |
| 18. New Mexico | 17 | 1,591,676 | 1,056,392 | 453,246 | 3,101,314 | 3.15 | 401 | 170 | 68,154 | 45.50 |
| 19. Wyoming | 35 | 4,207,483 | 484,380 | 27,980 | 4,719,843 | 7.03 | 1,679 | 201 | 337,576 | 13.98 |
| 20. Utah | 30 | 2,013,298 | 348,961 | 287,492 | 2,649,751 | 2.16 | 288 | 198 | 57,099 | 46.41 |
| 21. North-South Dakota | 13 | 297,242 | 48,366 | 239 | 345,847 | 2.68 | 90 | 148 | 13,279 | 26.04 |
| 22. Montana | 10 | 744,558 | 61,365 | 7,077 | 813,000 | 6.87 | 253 | 235 | 59,504 | 13.66 |
| 23. Washington | | | | | | | | | | |
| Total | 7,630 | 408,725,328 | 65,532,391 | 12,740,233 | 486,997,952 | 4.45 | 128,698 | 225 | 28,917,328 | 16.84 |

[1] Includes coal loaded at mine directly into railroad cars or river barges, hauled by trucks to railroad sidings, and hauled by trucks to waterways.

[2] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.

[3] Value received or charged for coal, f.o.b. mine. Includes a value, estimated by producer, for coal not sold.

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## NUMBER AND SIZE OF MINES

The unit in the statistical record is the mine, and operating companies are requested to make a separate report for each mine because its location is definitely known and can be related to a specific district or county; its identity can be followed through successive changes of ownership; and it is the natural operating unit from the standpoint of cost, mechanical equipment, mining practice, and output per man per day. See figure 6.

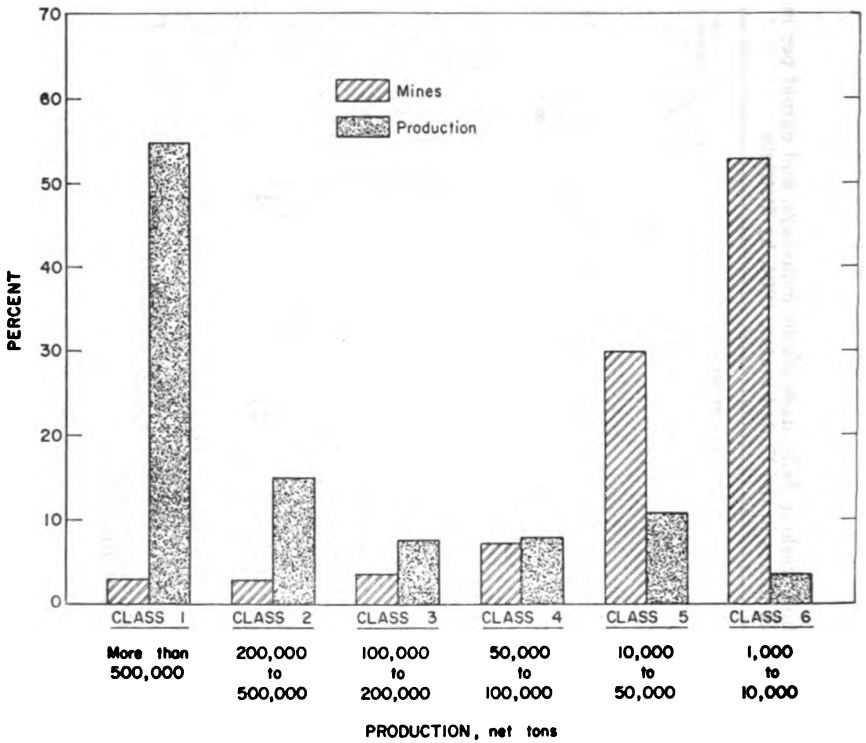


FIGURE 6.—Percentage of number of mines and of production of bituminous coal and lignite mines in the United States, 1964, by size of output.

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**TABLE 13.—Number and production of bituminous coal and lignite mines in the United States, 1964, by States and size of output**

| State | Class 1—500,000 tons and over | | | | Class 2—200,000 to 500,000 tons | | | | Class 3—100,000 to 200,000 tons | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mines | | Production | | Mines | | Production | | Mines | | Production | |
| | Number | Percentage | Net tons | Percentage | Number | Percentage | Net tons | Percentage | Number | Percentage | Net tons | Percentage |
| Alabama | 6 | 3.4 | 6,907,844 | 47.9 | 12 | 6.9 | 3,887,847 | 26.9 | 9 | 5.1 | 1,229,560 | 8.5 |
| Alaska | | | | | 2 | 40.0 | 700,477 | 94.0 | | | | |
| Arkansas | | | | | | | | | | | | |
| Colorado | 2 | 2.4 | 1,285,982 | 29.5 | 4 | 4.9 | 1,373,770 | 31.6 | 4 | 4.9 | 505,088 | 11.6 |
| Georgia | | | | | | | | | | | | |
| Illinois | 34 | 33.3 | 47,240,673 | 85.8 | 14 | 13.7 | 5,150,533 | 9.4 | 11 | 10.8 | 1,574,154 | 2.9 |
| Indiana | 12 | 20.0 | 11,595,737 | 76.9 | 7 | 11.7 | 2,584,386 | 17.2 | | | | |
| Iowa | | | | | | | | | 3 | 8.8 | 384,885 | 39.6 |
| Kansas | 1 | 14.3 | 899,416 | 71.2 | 1 | 14.3 | 230,851 | 18.3 | 1 | 14.3 | 105,793 | 8.4 |
| Kentucky | 31 | 1.5 | 41,549,675 | 50.2 | 26 | 1.3 | 8,544,307 | 10.3 | 43 | 2.1 | 5,977,225 | 7.2 |
| Maryland | | | | | 1 | 1.5 | 209,498 | 18.4 | 1 | 1.5 | 109,969 | 9.7 |
| Missouri | 4 | 20.0 | 2,786,329 | 85.6 | | | | | 1 | 5.0 | 188,816 | 5.8 |
| Montana (bituminous and lignite) | | | | | 1 | 7.7 | 294,082 | 85.0 | | | | |
| New Mexico | 1 | 9.1 | 2,116,069 | 71.3 | 2 | 18.2 | 824,033 | 27.7 | | | | |
| North Dakota (lignite) | 1 | 3.5 | 895,285 | 33.9 | 4 | 13.8 | 1,218,055 | 46.2 | 2 | 6.9 | 257,248 | 9.8 |
| Ohio | 19 | 4.5 | 20,556,502 | 55.1 | 16 | 3.8 | 3,979,447 | 10.7 | 35 | 8.3 | 4,811,790 | 12.9 |
| Oklahoma | | | | | 2 | 12.5 | 539,817 | 52.5 | 1 | 6.2 | 151,294 | 14.7 |
| Pennsylvania | 37 | 3.3 | 37,771,441 | 49.4 | 36 | 3.2 | 12,367,107 | 16.2 | 63 | 5.6 | 8,444,287 | 11.0 |
| South Dakota (lignite) | | | | | | | | | | | | |
| Tennessee | 1 | .4 | 552,341 | 9.2 | 3 | 1.2 | 966,375 | 16.2 | 7 | 2.8 | 922,197 | 15.4 |
| Utah | 3 | 8.6 | 1,847,019 | 39.1 | 3 | 8.6 | 1,129,912 | 23.9 | 6 | 17.1 | 841,673 | 17.8 |
| Virginia | 4 | .3 | 7,120,919 | 22.5 | 11 | .8 | 4,001,820 | 12.6 | 15 | 1.1 | 2,170,213 | 6.9 |
| Washington | | | | | | | | | | | | |
| West Virginia | 81 | 4.6 | 83,238,019 | 58.9 | 71 | 4.1 | 24,296,778 | 17.2 | 66 | 3.8 | 9,580,318 | 6.8 |
| Wyoming | 1 | 5.9 | 999,279 | 32.2 | 4 | 23.5 | 1,594,041 | 51.4 | 2 | 11.8 | 285,110 | 9.2 |
| Total | 238 | 3.1 | 267,362,530 | 54.9 | 220 | 2.9 | 73,893,136 | 15.2 | 270 | 3.5 | 37,539,620 | 7.7 |

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**TABLE 13.—Number and production of bituminous coal and lignite mines in the United States, 1964, by States and size of output—Continued**

| State | Class 4—50,000 to 100,000 tons | | | | Class 5—10,000 to 50,000 tons | | | | Class 6—less than 10,000 tons | | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mines | | Production | | Mines | | Production | | Mines | | Production | | Mines | Production (net tons) | |
| | Number | Percentage | Net tons | Percentage | Number | Percentage | Net tons | Percentage | Number | Percentage | Net tons | Percentage | | Total | Average per mine |
| Alabama | 12 | 6.9 | 807,153 | 5.6 | 49 | 28.0 | 1,174,953 | 8.1 | 87 | 49.7 | 428,097 | 3.0 | 175 | 14,435,454 | 82,488 |
| Alaska | | | | | 1 | 20.0 | 36,734 | 4.9 | 2 | 40.0 | 7,731 | 1.1 | 5 | 744,942 | 148,988 |
| Arkansas | 1 | 9.1 | 86,880 | 40.9 | 5 | 45.5 | 113,016 | 53.2 | 5 | 45.4 | 12,419 | 5.9 | 11 | 212,315 | 19,301 |
| Colorado | 8 | 9.7 | 590,555 | 13.6 | 19 | 23.2 | 406,498 | 9.3 | 45 | 54.9 | 193,352 | 4.4 | 82 | 4,355,245 | 53,113 |
| Georgia | | | | | | | | | 1 | 100.0 | 3,900 | 100.0 | 1 | 3,900 | 3,900 |
| Illinois | 7 | 6.9 | 492,294 | .9 | 21 | 20.6 | 508,320 | .9 | 15 | 14.7 | 56,628 | .1 | 102 | 55,022,602 | 539,437 |
| Indiana | 8 | 13.3 | 554,766 | 3.7 | 10 | 16.7 | 217,312 | 1.4 | 23 | 38.3 | 122,430 | .8 | 60 | 15,074,631 | 251,244 |
| Iowa | 4 | 11.8 | 253,354 | 26.0 | 11 | 32.3 | 265,542 | 27.3 | 16 | 47.1 | 69,433 | 7.1 | 34 | 973,214 | 28,624 |
| Kansas | | | | | 1 | 14.3 | 15,334 | 1.2 | 3 | 42.8 | 12,015 | .9 | 7 | 1,263,409 | 180,487 |
| Kentucky | 130 | 6.5 | 8,736,152 | 10.6 | 612 | 30.6 | 13,158,477 | 15.9 | 1,160 | 58.0 | 4,781,335 | 5.8 | 2,002 | 82,747,171 | 41,332 |
| Maryland | 2 | 3.0 | 150,942 | 13.3 | 18 | 26.9 | 487,110 | 42.9 | 45 | 67.1 | 178,317 | 15.7 | 67 | 1,135,836 | 16,953 |
| Missouri | 1 | 5.0 | 96,000 | 3.0 | 6 | 30.0 | 160,818 | 4.9 | 8 | 40.0 | 21,467 | .7 | 20 | 3,253,430 | 162,672 |
| Montana (bituminous and lignite) | | | | | 1 | 7.7 | 10,065 | 2.9 | 11 | 84.6 | 41,700 | 12.1 | 13 | 345,847 | 26,604 |
| New Mexico | | | | | | | | | 8 | 72.7 | 29,370 | 1.0 | 11 | 2,969,472 | 269,952 |
| North Dakota (lignite) | 1 | 3.4 | 77,899 | 2.9 | 5 | 17.2 | 107,193 | 4.1 | 16 | 55.2 | 81,071 | 3.1 | 29 | 2,636,751 | 90,922 |
| Ohio | 55 | 13.1 | 3,839,562 | 10.3 | 138 | 32.9 | 3,396,132 | 9.1 | 157 | 37.4 | 726,944 | 1.9 | 420 | 37,310,377 | 88,834 |
| Oklahoma | 3 | 18.8 | 250,780 | 24.4 | 2 | 12.5 | 58,888 | 5.7 | 8 | 50.0 | 27,217 | 2.7 | 16 | 1,027,996 | 64,250 |
| Pennsylvania | 106 | 9.4 | 7,354,853 | 9.6 | 348 | 31.0 | 8,528,120 | 11.1 | 533 | 47.5 | 2,064,950 | 2.7 | 1,123 | 76,530,758 | 68,148 |
| South Dakota (lignite) | | | | | 1 | 100.0 | 13,000 | 100.0 | | | | | 1 | 13,000 | 13,000 |
| Tennessee | 16 | 6.3 | 1,091,067 | 18.2 | 82 | 32.4 | 1,882,703 | 31.4 | 144 | 56.9 | 575,722 | 9.6 | 253 | 5,990,405 | 23,677 |
| Utah | 8 | 22.8 | 608,557 | 12.9 | 10 | 28.6 | 281,543 | 6.0 | 5 | 14.3 | 11,139 | .3 | 35 | 4,719,843 | 134,853 |
| Virginia | 78 | 5.6 | 5,057,220 | 16.0 | 387 | 27.6 | 9,147,572 | 28.9 | 903 | 64.6 | 4,155,740 | 13.1 | 1,398 | 31,653,484 | 22,642 |
| Washington | | | | | 2 | 40.0 | 48,618 | 71.4 | 3 | 60.0 | 19,440 | 28.6 | 5 | 68,058 | 13,612 |
| West Virginia | 111 | 6.4 | 7,779,353 | 5.5 | 567 | 32.5 | 12,631,653 | 8.9 | 847 | 48.6 | 3,882,377 | 2.7 | 1,743 | 141,408,498 | 81,129 |
| Wyoming | 2 | 11.8 | 157,621 | 5.1 | 3 | 17.6 | 45,158 | 1.5 | 5 | 29.4 | 20,105 | .6 | 17 | 3,101,314 | 182,430 |
| Total | 553 | 7.3 | 37,985,008 | 7.8 | 2,299 | 30.1 | 52,694,759 | 10.8 | 4,050 | 53.1 | 17,522,899 | 3.6 | 7,630 | 486,997,952 | 63,827 |

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## EMPLOYMENT AND PRODUCTIVITY

The bituminous coal and lignite industry has become highly mechanized in recent years. Mechanization has strongly affected production per man per day and the number of employees. In the past 20 years productivity has increased 197 percent and the number of employees has declined 67 percent. See figure 7.

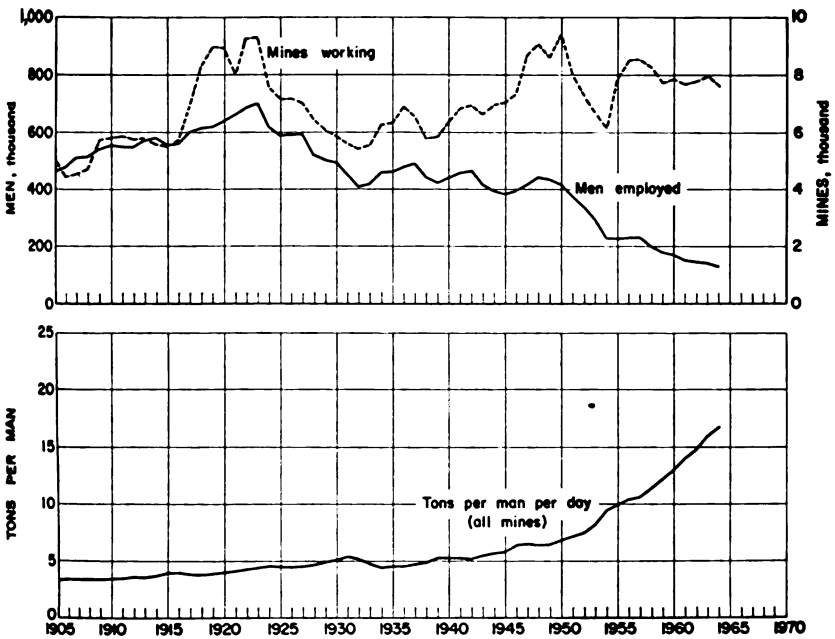


FIGURE 7.—Trends of employment, mechanization, and output per man at bituminous coal and lignite mines in the United States, 1905–64.

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**TABLE 14.—Production and average output per man per day at bituminous coal and lignite mines in the United States, 1964, by States and by underground, strip, and auger mining**

| State | Production (net tons) | | | | Percentage of total production | | | | Average tons per man per day | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Underground | Strip | Auger | Total | Underground | Strip | Auger | Total | Underground | Strip | Auger | Total |
| Alabama | 10,461,952 | 3,878,014 | 95,488 | 14,435,454 | 72.5 | 26.9 | 0.6 | 100.0 | 10.13 | 26.33 | 14.02 | 12.16 |
| Alaska | | 744,942 | | 744,942 | | 100.0 | | 100.0 | | 15.78 | | 15.78 |
| Arkansas | 73,884 | 138,431 | | 212,315 | 34.8 | 65.2 | | 100.0 | 5.59 | 19.71 | | 10.49 |
| Colorado | 3,409,338 | 945,907 | | 4,355,245 | 78.3 | 21.7 | | 100.0 | 11.23 | 39.54 | | 13.29 |
| Georgia | 3,900 | | | 3,900 | 100.0 | | | 100.0 | 2.70 | | | 2.70 |
| Illinois | 25,034,476 | 29,988,126 | | 55,022,602 | 45.5 | 54.5 | | 100.0 | 21.14 | 35.53 | | 27.13 |
| Indiana | 3,452,977 | 11,621,654 | | 15,074,631 | 22.9 | 77.1 | | 100.0 | 14.80 | 36.12 | | 27.16 |
| Iowa | 169,593 | 803,621 | | 973,214 | 17.4 | 82.6 | | 100.0 | 6.79 | 16.01 | | 12.95 |
| Kansas | | 1,263,409 | | 1,263,409 | | 100.0 | | 100.0 | | 20.57 | | 20.57 |
| Kentucky | 49,782,846 | 28,304,868 | 4,659,457 | 82,747,171 | 60.2 | 34.2 | 5.6 | 100.0 | 12.99 | 50.32 | 45.32 | 18.40 |
| Maryland | 385,525 | 750,311 | | 1,135,836 | 33.9 | 66.1 | | 100.0 | 8.32 | 26.59 | | 15.25 |
| Missouri | 32,687 | 3,220,743 | | 3,253,430 | 1.0 | 99.0 | | 100.0 | 3.87 | 31.67 | | 29.53 |
| Montana: | | | | | | | | | | | | |
| Bituminous | 44,541 | 1,365 | | 45,906 | 97.0 | 3.0 | | 100.0 | 6.09 | 6.26 | | 6.09 |
| Lignite | 5,859 | 294,082 | | 299,941 | 2.0 | 98.0 | | 100.0 | 3.21 | 75.00 | | 52.19 |
| Total Montana | 50,400 | 295,447 | | 345,847 | 14.6 | 85.4 | | 100.0 | 5.51 | 71.38 | | 26.04 |
| New Mexico | 418,300 | 2,551,172 | | 2,969,472 | 14.1 | 85.9 | | 100.0 | 12.50 | 75.56 | | 44.18 |
| North Dakota (lignite) | 1,867 | 2,634,884 | | 2,636,751 | .1 | 99.9 | | 100.0 | 5.01 | 47.54 | | 47.25 |
| Ohio | 10,744,862 | 24,815,302 | 1,750,213 | 37,310,377 | 28.8 | 66.5 | 4.7 | 100.0 | 13.38 | 21.12 | 49.41 | 18.53 |
| Oklahoma | 10,743 | 1,017,253 | | 1,027,996 | 1.0 | 99.0 | | 100.0 | 3.20 | 19.48 | | 18.50 |
| Pennsylvania | 51,976,150 | 23,505,457 | 1,049,151 | 76,530,758 | 67.9 | 30.7 | 1.4 | 100.0 | 12.72 | 19.90 | 28.05 | 14.43 |
| South Dakota (lignite) | | 13,000 | | 13,000 | 100.0 | | | 100.0 | | 10.00 | | 10.00 |
| Tennessee | 3,664,147 | 2,071,994 | 254,264 | 5,990,405 | 61.2 | 34.6 | 4.2 | 100.0 | 7.18 | 28.83 | 32.88 | 10.15 |
| Utah | 4,719,843 | | | 4,719,843 | 100.0 | | | 100.0 | 13.98 | | | 13.98 |
| Virginia | 28,064,802 | 2,450,755 | 1,137,927 | 31,653,484 | 88.7 | 7.7 | 3.6 | 100.0 | 13.47 | 34.78 | 50.56 | 14.54 |
| Washington | 68,058 | | | 68,058 | 100.0 | | | 100.0 | 5.53 | | | 5.53 |
| West Virginia | 129,156,067 | 7,867,872 | 4,384,559 | 141,408,498 | 91.3 | 5.6 | 3.1 | 100.0 | 14.60 | 27.03 | 43.81 | 15.31 |
| Wyoming | 125,497 | 2,975,817 | | 3,101,314 | 4.0 | 96.0 | | 100.0 | 7.74 | 57.30 | | 45.50 |
| Total | 321,807,914 | 151,858,979 | 13,331,059 | 486,997,952 | 66.1 | 31.2 | 2.7 | 100.0 | 13.74 | 29.29 | 42.63 | 16.84 |

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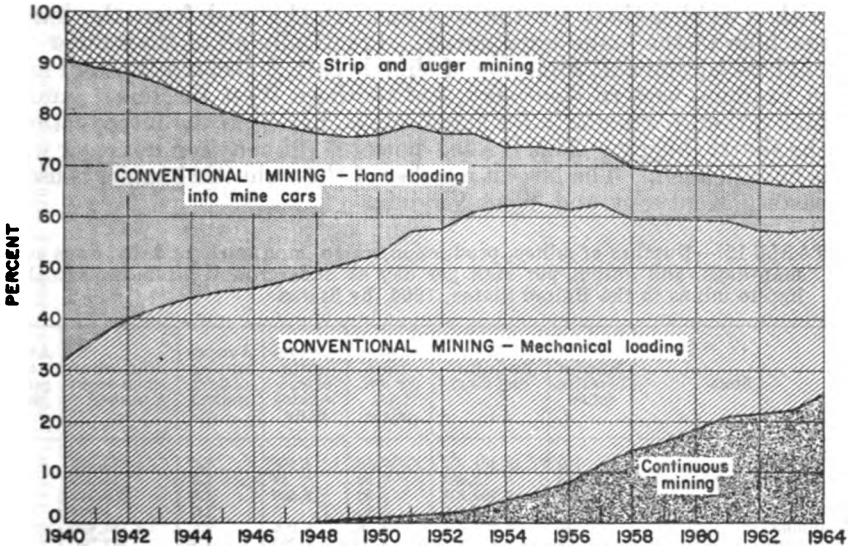


FIGURE 8.—Percentage of total production of bituminous coal and lignite in the United States, 1940–64, by type of mining and loading.

## UNDERGROUND MINING

Two-thirds of the output of bituminous coal and lignite is mined underground. The major tasks underground are cutting, drilling shotholes, loading, and haulage. Loading is discussed later in the section on mechanical loading. For many years, most of the underground production has been cut by machine; however, as the percentage of production by continuous-mining machines increases, the percentage cut by machines will decrease. The use of power drills for shotholes increased rapidly from less than 50 percent of the underground production in 1940 to a maximum of 84 percent in 1953. The use of continuous-mining machines decreased the tonnage powder-drilled for shotholes to 60 percent of the underground output. Trolley locomotives are the principal method of underground haulage; however, in recent years the use of conveyor haulage has increased steadily.

Mines producing 58 percent of the underground output reported 94,315 rail mine cars and 3,607 miles of rail track, while mines producing 5 percent used rubber-tired mine cars. Mines not reporting type of haulage produced 9 percent, and mines employing 100 percent conveyor haulage furnished 26 percent of the underground production, and shuttle buggies furnished 2 percent.

The largest number of mine cars (28 percent) were 4- to 5-ton capacity. However, 14 percent of all rail mine cars were large, 10 tons and over, hauling the largest amount (33 percent) of the tonnage handled by rail mine cars. In contrast, the most frequent size of rubber-tired mine cars was 2-ton capacity; cars of this size hauled 44 percent of the tonnage handled by rubber-tired mine cars.

A recent development in underground haulage is the introduction of a medium-sized rubber-tired mine car that is used in conjunction

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with a rubber-tired tractor to transport the coal from the loading machine to the main haulageway. Practically all of the rubber-tired haulage equipment, exclusive of shuttle cars, is located in small mines in Virginia, eastern Kentucky, and southern West Virginia. Another innovation, particularly for small mines, has been the introduction of the shuttle buggy. This is a self-powered rubber-tired mine car which is hand-loaded. The largest number of these shuttle buggies is used in eastern Kentucky and West Virginia.

**TABLE 15.—Number of mines, production, value, men working daily, days active, man-days, and output per man per day at underground bituminous coal and lignite mines in the United States, 1964, by States**

| State | Number of active mines | Production (net tons) | Average value per ton, f.o.b. mines | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|---|
| Alabama | 120 | 10,461,952 | $7.62 | 4,555 | 227 | 1,033,270 | 10.13 |
| Arkansas | 5 | 73,884 | 7.30 | 58 | 228 | 13,222 | 5.59 |
| Colorado | 73 | 3,409,338 | 5.92 | 1,599 | 190 | 303,712 | 11.23 |
| Georgia | 1 | 3,900 | 3.82 | 13 | 111 | 1,444 | 2.70 |
| Illinois | 45 | 25,034,476 | 3.76 | 5,096 | 232 | 1,184,429 | 21.14 |
| Indiana | 23 | 3,452,977 | 4.09 | 1,323 | 176 | 233,240 | 14.80 |
| Iowa | 13 | 169,593 | 4.09 | 164 | 152 | 24,964 | 6.79 |
| Kentucky | 1,760 | 49,782,846 | 4.19 | 19,233 | 199 | 3,831,455 | 12.99 |
| Maryland | 35 | 385,525 | 4.24 | 201 | 230 | 46,283 | 8.32 |
| Missouri | 4 | 32,687 | 4.76 | 49 | 173 | 8,455 | 3.87 |
| Montana: | | | | | | | |
| Bituminous | 8 | 44,541 | 7.57 | 57 | 128 | 7,314 | 6.09 |
| Lignite | 3 | 5,859 | 4.57 | 13 | 140 | 1,826 | 3.21 |
| Total Montana | 11 | 50,400 | 7.22 | 70 | 131 | 9,140 | 5.51 |
| New Mexico | 8 | 418,300 | 8.89 | 181 | 185 | 33,454 | 12.50 |
| North Dakota (lignite) | 1 | 1,867 | 4.62 | 5 | 75 | 373 | 5.01 |
| Ohio | 111 | 10,744,862 | 4.26 | 3,809 | 211 | 803,307 | 13.38 |
| Oklahoma | 4 | 10,743 | 7.43 | 29 | 116 | 3,357 | 3.20 |
| Pennsylvania | 537 | 51,976,150 | 5.75 | 17,941 | 228 | 4,086,158 | 12.72 |
| Tennessee | 199 | 3,664,147 | 3.98 | 2,586 | 197 | 510,508 | 7.18 |
| Utah | 35 | 4,719,843 | 7.03 | 1,679 | 201 | 337,576 | 13.98 |
| Virginia | 1,298 | 28,064,802 | 4.01 | 8,874 | 235 | 2,084,238 | 13.47 |
| Washington | 5 | 68,058 | 8.45 | 76 | 162 | 12,296 | 5.53 |
| West Virginia | 1,452 | 129,156,067 | 5.02 | 37,280 | 237 | 8,843,614 | 14.60 |
| Wyoming | 6 | 125,497 | 6.11 | 147 | 110 | 16,217 | 7.74 |
| Total | 5,746 | 321,807,914 | 4.92 | 104,968 | 223 | 23,420,712 | 13.74 |

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**TABLE 16.—Underground production of bituminous coal and lignite in the United States, 1964, by States and mining methods**

| State | Cut by hand and shot from solid | | Cut by machines | | | | Mined by continuous-mining machines | | Total underground (net tons) |
|---|---|---|---|---|---|---|---|---|---|
| | Net tons | Percentage of total underground | Net tons | Percentage of total underground | Number of coal-cutting machines | Average output per machine (net tons) | Net tons | Percentage of total underground | |
| Alabama | 148,071 | 1.4 | 10,313,881 | 98.6 | 156 | 66,115 | | | 10,461,952 |
| Arkansas | | | 73,884 | 100.0 | 9 | 8,209 | | | 73,884 |
| Colorado | 175,069 | 5.1 | 1,411,432 | 41.4 | 127 | 11,114 | 1,822,837 | 53.5 | 3,409,338 |
| Georgia | 3,900 | 100.0 | | | | | | | 3,900 |
| Illinois | | | 16,022,510 | 64.0 | 95 | 168,658 | 9,011,966 | 36.0 | 25,034,476 |
| Indiana | | | 3,229,709 | 93.5 | 53 | 60,938 | 223,268 | 6.5 | 3,452,977 |
| Iowa | 15,130 | 8.9 | 154,463 | 91.1 | 13 | 13,046 | | | 169,593 |
| Kansas | | | | | | | | | |
| Kentucky | 4,213,768 | 8.5 | 39,323,511 | 79.0 | 1,282 | 30,674 | 6,245,567 | 12.5 | 49,782,846 |
| Maryland | 91,834 | 23.8 | 191,480 | 49.7 | 23 | 8,325 | 102,211 | 26.5 | 385,525 |
| Missouri | 1,000 | 3.1 | 31,687 | 96.9 | 4 | 7,922 | | | 32,687 |
| Montana: | | | | | | | | | |
| Bituminous | | | 44,541 | 100.0 | 13 | 3,426 | | | 44,541 |
| Lignite | 1,379 | 23.5 | 4,480 | 76.5 | 2 | 2,240 | | | 5,859 |
| Total Montana | 1,379 | 2.7 | 49,021 | 97.3 | 15 | 3,268 | | | 50,400 |
| New Mexico | 11,766 | 2.1 | 8,960 | 2.8 | 4 | 2,240 | 397,574 | 95.1 | 418,300 |
| North Dakota (lignite) | 1,867 | 100.0 | | | | | | | 1,867 |
| Ohio | 27,990 | .3 | 6,197,635 | 57.7 | 163 | 38,022 | 4,519,237 | 42.0 | 10,744,862 |
| Oklahoma | 3,829 | 35.6 | 6,914 | 64.4 | 3 | 3,581 | | | 10,743 |
| Pennsylvania | 447,426 | .9 | 12,696,797 | 24.4 | 588 | 21,593 | 38,831,927 | 74.7 | 51,976,150 |
| Tennessee | 311,268 | 8.5 | 2,972,127 | 81.1 | 149 | 19,947 | 380,752 | 10.4 | 3,664,147 |
| Utah | 33,531 | .7 | 1,935,091 | 41.0 | 57 | 33,949 | 2,751,221 | 58.3 | 4,719,843 |
| Virginia | 4,120,663 | 14.7 | 20,620,157 | 73.5 | 961 | 21,457 | 3,323,982 | 11.8 | 28,064,802 |
| Washington | 68,058 | 100.0 | | | | | | | 68,058 |
| West Virginia | 2,665,624 | 2.1 | 69,423,945 | 53.7 | 1,595 | 43,526 | 57,066,498 | 44.2 | 129,156,067 |
| Wyoming | | | 125,497 | 100.0 | 23 | 5,456 | | | 125,497 |
| Total | 12,342,173 | 3.8 | 184,788,701 | 57.4 | 5,320 | 34,735 | 124,677,040 | 38.8 | 321,807,914 |

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## TABLE 17.—Summary of drilling operations at underground bituminous coal and lignite mines in the United States

| Year | Number of mines using power drills | Number of power drills [1] | | | | | Production (thousand net tons) | | | | Production, percent | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Electric | Face or coal | Compressed air | Roof or rock | Total | Where shot holes are power-drilled | Where shot holes are hand-drilled | Where no shot-holes are required (continuous mining) | Total | Where shot holes are power-drilled | Where shot holes are hand-drilled | Where no shot-holes are required (continuous mining) |
| 1936 | 599 | 3,968 | ---------- | 1,302 | ---------- | 5,270 | 111,950 | 299,012 | ---------- | 410,962 | 27.2 | 72.8 | ---------- |
| 1937 | NA | NA | ---------- | NA | ---------- | NA | NA | NA | ---------- | 413,780 | NA | NA | ---------- |
| 1938 | 1,061 | 5,071 | ---------- | 1,465 | ---------- | 6,536 | 122,581 | 195,557 | ---------- | 318,138 | 38.5 | 61.5 | ---------- |
| 1939 | NA | NA | ---------- | NA | ---------- | NA | NA | NA | ---------- | 357,133 | NA | NA | ---------- |
| 1940 | 1,172 | 6,613 | ---------- | 1,378 | ---------- | 7,991 | 197,083 | 220,521 | ---------- | 417,604 | 47.2 | 52.8 | ---------- |
| 1941 | 1,266 | 7,697 | ---------- | 1,502 | ---------- | 9,199 | 237,213 | 221,865 | ---------- | 459,078 | 51.7 | 48.3 | ---------- |
| 1942 | 1,364 | 8,482 | ---------- | 1,564 | ---------- | 10,046 | 281,530 | 233,960 | ---------- | 515,490 | 54.6 | 45.4 | ---------- |
| 1943 | 1,376 | 8,930 | ---------- | 1,630 | ---------- | 10,560 | 299,805 | 210,687 | ---------- | 510,492 | 58.7 | 41.3 | ---------- |
| 1944 | 1,501 | 9,755 | ---------- | 1,903 | ---------- | 11,658 | 324,116 | 194,562 | ---------- | 518,678 | 62.5 | 37.5 | ---------- |
| 1945 | 1,504 | 10,267 | ---------- | 1,855 | ---------- | 12,122 | 302,786 | 164,844 | ---------- | 467,630 | 64.7 | 35.3 | ---------- |
| 1946 | 1,702 | 10,968 | ---------- | 1,884 | ---------- | 12,852 | 278,734 | 142,224 | ---------- | 420,958 | 66.2 | 33.8 | ---------- |
| 1947 | 2,522 | 12,940 | ---------- | 1,449 | ---------- | 14,389 | 351,866 | 139,363 | ---------- | 491,229 | 71.6 | 28.4 | ---------- |
| 1948 | 2,798 | 13,970 | ---------- | 1,312 | ---------- | 15,282 | 336,873 | 122,689 | 450 | 460,012 | 73.2 | 26.7 | 0.1 |
| 1949 | 2,923 | 14,087 | ---------- | 1,411 | ---------- | 15,498 | 251,329 | 77,894 | 2,600 | 331,823 | 75.7 | 23.5 | .8 |
| 1950 | 3,112 | 14,277 | ---------- | 1,282 | ---------- | 15,559 | 286,661 | 101,333 | 4,850 | 392,844 | 73.0 | 25.8 | 1.2 |
| 1951 | 3,027 | 14,231 | ---------- | 1,345 | ---------- | 15,576 | 324,645 | 85,136 | 6,061 | 415,842 | 78.0 | 20.5 | 1.5 |
| 1952 | 2,830 | 13,468 | ---------- | 1,292 | ---------- | 14,760 | 284,048 | 64,162 | 8,215 | 356,425 | 79.7 | 18.0 | 2.3 |
| 1953 | 2,486 | 12,054 | ---------- | 1,053 | ---------- | 13,107 | 293,161 | 44,560 | 11,830 | 349,551 | 83.9 | 12.7 | 3.4 |
| 1954 | 2,137 | 10,782 | ---------- | 885 | ---------- | 11,667 | 233,557 | 39,219 | 16,336 | 289,112 | 80.7 | 13.6 | 5.7 |
| 1955 | 2,003 | 9,533 | ---------- | 476 | ---------- | 10,009 | 285,348 | 30,657 | 27,460 | 343,465 | 83.1 | 8.9 | 8.0 |
| 1956 | 4,033 | (1) | 11,021 | (1) | 2,443 | 13,464 | 306,675 | 19,192 | 39,907 | 365,774 | 83.8 | 5.3 | 10.9 |
| 1957 | 4,152 | (1) | 10,938 | (1) | 2,981 | 13,919 | 294,186 | 12,680 | 53,783 | 360,649 | 81.6 | 3.5 | 14.9 |
| 1958 | 4,410 | (1) | 9,691 | (1) | 2,947 | 12,638 | 216,226 | 14,285 | 56,373 | 286,884 | 75.4 | 5.0 | 19.6 |
| 1959 | 3,979 | (1) | 8,524 | (1) | 2,814 | 11,338 | 207,043 | 10,599 | 65,792 | 283,434 | 73.1 | 3.7 | 23.2 |
| 1960 | 4,294 | (1) | 8,265 | (1) | 2,840 | 11,105 | 194,956 | 12,004 | 77,928 | 284,888 | 68.4 | 4.2 | 27.4 |
| 1961 | 4,333 | (1) | 7,837 | (1) | 3,153 | 10,990 | 181,741 | 6,704 | 84,321 | 272,766 | 66.6 | 2.5 | 30.9 |
| 1962 | 4,660 | (1) | 7,744 | (1) | 3,121 | 10,865 | 187,324 | 3,768 | 90,174 | 281,266 | 66.6 | 1.4 | 32.0 |
| 1963 | 4,868 | (1) | 7,496 | (1) | 2,913 | 10,409 | 193,036 | 4,870 | 104,350 | 302,256 | 63.9 | 1.6 | 34.5 |
| 1964 | 4,734 | (1) | 7,185 | (1) | 2,847 | 10,032 | 193,044 | 4,087 | 124,677 | 321,808 | 60.0 | 1.3 | 38.7 |

NA Not available.

[1] Total number of power drills before 1956 are not strictly comparable with the figures for 1956 to date. Data were collected by "type" of drills before 1956 and by "use" of drills 1956 to date. Most of the "electric" drills were used in coal and most of the "compressed air" drills were used in rock. "Face or coal" drills include hand-held, post mounted, and mobile drills. "Roof or rock" drills include rotary and percussion drills.

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**TABLE 18.—Use of power drills in underground bituminous coal and lignite mines in the United States, 1964, by States**

| State | Number of power drills | | | | | | | Production where shotholes are power-drilled (net tons) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of mines using power drills | Face or coal drills | | Roof or rock drills | | | | Handheld and post-mounted drills | Mobile drills | Total | Percentage of total underground |
| | | Handheld and post-mounted | Mobile | Roof bolting | | Other uses | | | | | |
| | | | | Rotary | Percussion | Rotary | Percussion | | | | |
| Alabama | 85 | 174 | 19 | 47 | 53 | 3 | 21 | 8,379,482 | 2,013,301 | 10,392,783 | 99.3 |
| Arkansas | 3 | 7 | | 1 | | 3 | | 68,777 | | 68,777 | 93.1 |
| Colorado | 62 | 152 | 14 | 6 | 25 | | 3 | 1,363,670 | 489,999 | 1,853,669 | 54.4 |
| Georgia | | | | | | | | | | | |
| Illinois | 45 | 21 | 108 | 130 | | 2 | 1 | 247,662 | 15,774,848 | 16,022,510 | 64.0 |
| Indiana | 23 | 27 | 25 | 37 | | | 1 | 635,248 | 2,594,461 | 3,229,709 | 93.5 |
| Iowa | 9 | 11 | 2 | 4 | | | | 39,697 | 114,306 | 154,003 | 90.8 |
| Kentucky | 1,326 | 1,679 | 147 | 248 | 123 | 4 | 26 | 24,095,020 | 18,317,987 | 42,413,007 | 85.2 |
| Maryland | 16 | 26 | | | | 2 | | 192,980 | | 192,980 | 50.1 |
| Missouri | 1 | 1 | | | | | | 27,415 | | 27,415 | 83.9 |
| Montana: | | | | | | | | | | | |
| Bituminous | 8 | 12 | | 1 | | | | 44,541 | | 44,541 | 100.0 |
| Lignite | 3 | 6 | | | | | | 5,859 | | 5,859 | 100.0 |
| Total Montana | 11 | 18 | | 1 | | | | 50,400 | | 50,400 | 100.0 |
| New Mexico | 7 | 11 | | 2 | 8 | | | 19,254 | | 19,254 | 4.6 |
| North Dakota (lignite) | 1 | 1 | | | | | | 1,867 | | 1,867 | 100.0 |
| Ohio | 103 | 120 | 53 | 92 | 4 | | | 895,855 | 5,304,677 | 6,200,532 | 57.7 |
| Oklahoma | 2 | 3 | | | | | | 6,914 | | 6,914 | 64.4 |
| Pennsylvania | 346 | 528 | 54 | 296 | 241 | 32 | 97 | 5,807,720 | 6,744,987 | 12,552,707 | 24.2 |
| Tennessee | 108 | 170 | 1 | 4 | 5 | 7 | 2 | 2,747,613 | 62,200 | 2,809,813 | 76.7 |
| Utah | 31 | 34 | 53 | 7 | 77 | 1 | 40 | 691,594 | 1,589,689 | 2,281,283 | 48.3 |
| Virginia | 1,264 | 1,331 | 15 | 52 | 68 | 8 | 13 | 19,244,889 | 3,875,550 | 23,120,439 | 82.4 |
| Washington | 5 | 18 | | | | | | 68,058 | | 68,058 | 100.0 |
| West Virginia | 1,281 | 2,160 | 184 | 697 | 292 | 14 | 44 | 47,264,808 | 24,194,107 | 71,458,915 | 55.3 |
| Wyoming | 5 | 17 | 1 | 3 | | | | 118,073 | 431 | 118,504 | 94.4 |
| Total | 4,734 | 6,509 | 676 | 1,627 | 896 | 76 | 248 | 111,966,996 | 81,076,543 | 193,043,539 | 60.0 |

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**TABLE 19.—Number of underground bituminous coal and lignite mines and number of haulage units in use in the United States, in selected years [1]**

| Year | Underground mines | Locomotives | | | | Rope-haulage units | | | Shuttle cars | | | Gathering and haulage conveyors | Animals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Trolley | Battery | Other types | Total | Portable | Stationary | Total | Cable reel | Battery | Total | | |
| 1924 | 7,352 | [2] 12,765 | 1,515 | 443 | 14,723 | NA | NA | 649 | NA | NA | NA | NA | 36,352 |
| 1946 | 5,888 | 14,110 | 1,011 | 110 | 15,231 | 4,084 | 1,009 | 5,093 | NA | NA | NA | 457 | 10,185 |
| 1948 | 7,108 | 14,617 | 904 | 74 | 15,595 | 3,886 | 1,044 | 4,930 | NA | NA | NA | 755 | 10,834 |
| 1949 | 6,798 | 14,090 | 928 | 59 | 15,077 | 3,904 | 1,073 | 4,977 | 2,144 | 623 | 2,767 | 860 | 10,313 |
| 1950 | 7,559 | 13,822 | 949 | 62 | 14,833 | 4,225 | 1,037 | 5,262 | 2,782 | 512 | 3,294 | 1,013 | 10,033 |
| 1951 | 6,225 | 13,327 | 900 | 51 | 14,278 | 3,875 | 916 | 4,791 | 3,191 | 567 | 3,758 | 1,094 | 7,478 |
| 1952 | 5,632 | 12,545 | 812 | 41 | 13,398 | 3,584 | 852 | 4,436 | 3,382 | 462 | 3,844 | 1,066 | 6,555 |
| 1953 | 5,034 | 11,311 | 678 | 45 | 12,034 | 2,838 | 727 | 3,565 | 3,797 | 425 | 4,222 | 1,042 | 5,354 |
| 1954 | 4,653 | 10,155 | 762 | 38 | 10,955 | 1,926 | 781 | 2,707 | 4,400 | 431 | 4,831 | 1,081 | 5,409 |
| 1955 | 6,035 | 9,538 | 658 | 40 | 10,236 | 1,327 | 577 | 1,904 | 4,375 | 239 | 4,614 | 1,002 | 6,440 |
| 1956 | 6,542 | 9,445 | 861 | 102 | 10,408 | 1,420 | 575 | 1,995 | 4,757 | 257 | 5,014 | 1,114 | 6,097 |
| 1957 | 6,512 | 8,997 | 898 | 138 | 10,033 | 1,214 | 616 | 1,830 | 5,129 | 257 | 5,386 | 1,233 | 5,054 |
| 1958 | 6,319 | 8,057 | 920 | 138 | 9,115 | 926 | 538 | 1,464 | 4,871 | 259 | 5,130 | 1,235 | 4,678 |
| 1959 | 5,815 | 7,263 | 949 | 137 | 8,349 | 900 | 504 | 1,404 | 4,795 | 255 | 5,050 | 1,416 | 4,063 |
| 1960 | 5,989 | 6,922 | 946 | 173 | 8,041 | 892 | 510 | 1,402 | 4,722 | 236 | 4,958 | 1,566 | 3,503 |
| 1961 | 5,843 | 6,362 | 583 | 162 | 7,107 | [3] | [3] | [3] | 4,687 | 182 | 4,869 | 1,635 | [3] |
| 1962 | 5,946 | 5,874 | 461 | 123 | 6,458 | [3] | [3] | [3] | 4,746 | 212 | 4,958 | 1,786 | [3] |
| 1963 | 6,129 | 5,273 | 484 | 113 | 5,870 | [3] | [3] | [3] | 4,952 | 175 | 5,127 | 1,998 | [3] |
| 1964 | 5,746 | 4,974 | 423 | 50 | 5,447 | [3] | [3] | [3] | 4,933 | 115 | 5,048 | 2,150 | [3] |

NA Not available.

[1] Exclusive of lignite and Virginia semianthracite mines in 1946, 1948, and 1949.
[2] Includes combination trolley and battery locomotives.
[3] Canvass discontinued.

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**TABLE 20.—Haulage units and length of rail track in use in bituminous coal and lignite underground mines in the United States, 1964, by States**

| State | Locomotives | | | Tractor, rubber-tired | Mine cars [1] | | Shuttle cars | | Shuttle buggies [1] | Gathering and haulage conveyors [1] | | Rail track reported (miles) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trolley | Battery | All others | | Rail | Rubber-tired | Cable reel | Battery | | Units | Miles | Main line | All other | Total |
| Alabama | 137 | | | 26 | 3,179 | | 173 | | | 65 | 27.7 | 75.3 | 50.6 | 125.9 |
| Arkansas | | 1 | | | 45 | | | | | | | 1.0 | | 1.0 |
| Colorado | 74 | 33 | | | 2,727 | | 108 | 11 | 1 | 25 | 7.5 | 20.9 | 11.6 | 32.5 |
| Illinois | 117 | 24 | | 8 | 2,838 | | 281 | 3 | | 146 | 61.2 | 52.2 | 27.2 | 79.4 |
| Indiana | 72 | 3 | 1 | | 1,281 | | 68 | 2 | 1 | 19 | 4.9 | 37.2 | 26.1 | 63.3 |
| Iowa | 6 | 1 | | | 571 | | 7 | | | | | 10.8 | 1.3 | 12.1 |
| Kentucky | 810 | 114 | 5 | 458 | 8,718 | 1,478 | 724 | 42 | 674 | 199 | 56.1 | 228.5 | 101.7 | 330.2 |
| Maryland | 5 | 5 | | 2 | 192 | 14 | 2 | | 9 | 8 | 1.6 | 7.1 | 3.4 | 10.5 |
| Missouri | | 1 | | | 36 | | | | | | | 1.5 | .2 | 1.7 |
| Montana: | | | | | | | | | | | | | | |
| Bituminous | 7 | 1 | | | 138 | | 4 | | | | | 2.8 | | 2.8 |
| Lignite | | | 1 | | 23 | | | | | | | 1.0 | | 1.0 |
| Total Montana | 7 | 1 | 1 | | 161 | | 4 | | | | | 3.8 | | 3.8 |
| New Mexico | 9 | 1 | | | 149 | | 10 | | | 1 | .3 | 7.6 | 1.8 | 9.4 |
| Ohio | 205 | 19 | 6 | 4 | 3,348 | 17 | 149 | | | 60 | 14.1 | 106.0 | 45.2 | 151.2 |
| Oklahoma | | | | | 17 | | | | | | | 1.0 | .2 | 1.2 |
| Pennsylvania | 1,351 | 91 | 20 | 104 | 26,236 | 179 | 970 | 12 | 32 | 477 | 132.6 | 657.7 | 333.6 | 991.3 |
| Tennessee | 96 | 1 | | 15 | 868 | 59 | 54 | | 41 | 1 | .3 | 25.3 | 10.3 | 35.6 |
| Utah | 103 | 3 | | 6 | 2,799 | 1 | 156 | 8 | 2 | 63 | 12.8 | 99.2 | 32.0 | 131.2 |
| Virginia | 350 | 47 | 1 | 664 | 3,928 | 3,337 | 210 | | 44 | 93 | 38.4 | 157.8 | 52.8 | 210.6 |
| Washington | 3 | | | | 52 | | 2 | | | | | 1.6 | | 1.6 |
| West Virginia | 1,629 | 74 | 16 | 414 | 37,118 | 1,610 | 2,008 | 37 | 721 | 990 | 292.3 | 957.3 | 455.0 | 1,412.3 |
| Wyoming | | 4 | | | 52 | | 7 | | 1 | 3 | .9 | | 2.0 | 2.0 |
| Total | 4,974 | 423 | 50 | 1,701 | 94,315 | 6,695 | 4,933 | 115 | 1,526 | 2,150 | 650.7 | 2,451.8 | 1,155.0 | 3,606.8 |

[1] See table 21 for percentage of tonnage not reported.

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**TABLE 21.—Method of haulage at bituminous coal and lignite underground mines in the United States, 1964, by States**

| State | Production (net tons) from mines | | | | | | Percentage of total underground production from mines | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Reporting rail mine cars | Reporting rubber-tired mine cars | Reporting shuttle buggies | With conveyor haulage only | Not reporting type of haulage | Total | Reporting rail mine cars | Reporting rubber-tired mine cars | Reporting shuttle buggies | With conveyor haulage only | Not reporting type of haulage | Total |
| Alabama | 5,599,857 | | | 3,838,675 | 1,023,420 | 10,461,952 | 53.5 | | | 36.7 | 9.8 | 100.0 |
| Arkansas | 44,107 | | | | 29,777 | 73,884 | 59.7 | | | | 40.3 | 100.0 |
| Colorado | 1,668,915 | | 13,155 | 1,540,416 | 186,852 | 3,409,338 | 48.9 | | 0.4 | 45.2 | 5.5 | 100.0 |
| Illinois | 8,265,822 | | | 16,327,068 | 441,586 | 25,034,476 | 33.0 | | | 65.2 | 1.8 | 100.0 |
| Indiana | 2,006,973 | | | 1,418,838 | 27,166 | 3,452,977 | 58.1 | | | 41.1 | .8 | 100.0 |
| Iowa | 169,593 | | | | | 169,593 | 100.0 | | | | | 100.0 |
| Kentucky | 18,482,329 | 6,274,629 | 2,523,124 | 11,391,236 | 11,111,528 | 49,782,846 | 37.1 | 12.6 | 5.1 | 22.9 | 22.3 | 100.0 |
| Maryland | 75,197 | 50,370 | 28,818 | 150,942 | 80,198 | 385,525 | 19.5 | 13.1 | 7.5 | 39.1 | 20.8 | 100.0 |
| Missouri | 27,415 | | | | 5,272 | 32,687 | 83.9 | | | | 16.1 | 100.0 |
| Montana: | | | | | | | | | | | | |
| Bituminous | 44,541 | | | | | 44,541 | 100.0 | | | | | 100.0 |
| Lignite | 3,383 | | | | 2,476 | 5,859 | 57.7 | | | | 42.3 | 100.0 |
| Total Montana | 47,924 | | | | 2,476 | 50,400 | 95.1 | | | | 4.9 | 100.0 |
| New Mexico | 412,165 | | | | 6,135 | 418,300 | 98.5 | | | | 1.5 | 100.0 |
| Ohio | 9,835,326 | 24,919 | | 767,853 | 116,764 | 10,744,862 | 91.5 | .2 | | 7.2 | 1.1 | 100.0 |
| Oklahoma | 5,325 | | | | 5,418 | 10,743 | 49.6 | | | | 50.4 | 100.0 |
| Pennsylvania | 40,970,037 | 214,112 | 161,241 | 10,160,212 | 470,548 | 51,976,150 | 78.8 | .4 | .3 | 19.6 | .9 | 100.0 |
| Tennessee | 1,553,916 | 88,714 | 154,468 | 30,000 | 1,837,049 | 3,664,147 | 42.4 | 2.4 | 4.2 | .8 | 50.2 | 100.0 |
| Utah | 3,837,966 | 10,555 | | 637,737 | 233,585 | 4,719,843 | 81.3 | .2 | | 13.5 | 5.0 | 100.0 |
| Virginia | 5,887,676 | 6,772,272 | 46,107 | 6,504,753 | 8,853,994 | 28,064,802 | 21.0 | 24.1 | .2 | 23.2 | 31.5 | 100.0 |
| Washington | 59,067 | | | | 8,991 | 68,058 | 86.8 | | | | 13.2 | 100.0 |
| West Virginia | 88,909,363 | 4,264,250 | 2,650,508 | 29,846,472 | 3,485,474 | 129,156,067 | 68.8 | 3.3 | 2.1 | 23.1 | 2.7 | 100.0 |
| Wyoming | 16,398 | | 2,331 | | 106,768 | 125,497 | 13.1 | | 1.8 | | 85.1 | 100.0 |
| Other States [1] | | | | | 5,767 | 5,767 | | | | | 100.0 | 100.0 |
| Total | 187,875,371 | 17,699,821 | 5,579,752 | 82,614,202 | 28,038,768 | 321,807,914 | 58.4 | 5.5 | 1.7 | 25.7 | 8.7 | 100.0 |

[1] Includes Georgia and North Dakota (lignite).

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**TABLE 22.—Rail mine cars used at bituminous coal and lignite underground mines in the United States, 1964, by States [1]**

| State | Capacity | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 ton | 2 tons | 3 tons | 4–5 tons | 6–9 tons | 10 tons and over | Total |
| **NUMBER REPORTED** | | | | | | | |
| Alabama | 100 | 19 | 1 | 1,809 | 1,210 | 40 | 3,179 |
| Arkansas | 36 | 9 | | | | | 45 |
| Colorado | 50 | 2,083 | 180 | 339 | 15 | 60 | 2,727 |
| Illinois | 575 | 1,149 | 85 | 175 | 719 | 135 | 2,838 |
| Indiana | 22 | 169 | 390 | 560 | 140 | | 1,281 |
| Iowa | 403 | 148 | 20 | | | | 571 |
| Kentucky | 257 | 1,743 | 1,189 | 3,719 | 421 | 1,389 | 8,718 |
| Maryland | 127 | 61 | 4 | | | | 192 |
| Missouri | 36 | | | | | | 36 |
| Montana: | | | | | | | |
| Bituminous | | 72 | 50 | 16 | | | 138 |
| Lignite | 23 | | | | | | 23 |
| Total Montana | 23 | 72 | 50 | 16 | | | 161 |
| New Mexico | 44 | 11 | | | | 94 | 149 |
| Ohio | 380 | 297 | 70 | 641 | 766 | 1,194 | 3,348 |
| Oklahoma | | 4 | 8 | | 5 | | 17 |
| Pennsylvania | 3,153 | 3,963 | 5,586 | 2,110 | 9,057 | 2,367 | 26,236 |
| Tennessee | 244 | 121 | 18 | 485 | | | 868 |
| Utah | | 21 | 304 | 1,531 | 943 | | 2,799 |
| Virginia | 418 | 299 | 1,255 | 1,482 | 174 | 300 | 3,928 |
| Washington | 25 | | | 27 | | | 52 |
| West Virginia | 281 | 2,463 | 8,819 | 13,430 | 4,706 | 7,419 | 37,118 |
| Wyoming | | | | 52 | | | 52 |
| Total | 6,174 | 12,632 | 17,979 | 26,376 | 18,156 | 12,998 | 94,315 |
| **PERCENTAGE OF TOTAL** | | | | | | | |
| Alabama | 3.1 | 0.6 | 0.1 | 56.9 | 38.1 | 1.2 | 100.0 |
| Arkansas | 80.0 | 20.0 | | | | | 100.0 |
| Colorado | 1.8 | 76.4 | 6.6 | 12.4 | .6 | 2.2 | 100.0 |
| Illinois | 20.3 | 40.5 | 3.0 | 6.2 | 25.3 | 4.7 | 100.0 |
| Indiana | 1.7 | 13.2 | 30.5 | 43.7 | 10.9 | | 100.0 |
| Iowa | 70.6 | 25.9 | 3.5 | | | | 100.0 |
| Kentucky | 3.0 | 20.0 | 13.6 | 42.7 | 4.8 | 15.9 | 100.0 |
| Maryland | 66.1 | 31.8 | 2.1 | | | | 100.0 |
| Missouri | 100.0 | | | | | | 100.0 |
| Montana: | | | | | | | |
| Bituminous | | 52.2 | 36.2 | 11.6 | | | 100.0 |
| Lignite | 100.0 | | | | | | 100.0 |
| Total Montana | 14.3 | 44.7 | 31.1 | 9.9 | | | 100.0 |
| New Mexico | 29.5 | 7.4 | | | | 63.1 | 100.0 |
| Ohio | 11.3 | 8.9 | 2.1 | 19.1 | 22.9 | 35.7 | 100.0 |
| Oklahoma | | 23.5 | 47.1 | | 29.4 | | 100.0 |
| Pennsylvania | 12.0 | 15.1 | 21.3 | 8.1 | 34.5 | 9.0 | 100.0 |
| Tennessee | 28.1 | 13.9 | 2.1 | 55.9 | | | 100.0 |
| Utah | | .7 | 10.9 | 54.7 | 33.7 | | 100.0 |
| Virginia | 10.7 | 7.6 | 32.0 | 37.7 | 4.4 | 7.6 | 100.0 |
| Washington | 48.1 | | | 51.9 | | | 100.0 |
| West Virginia | .8 | 6.6 | 23.7 | 36.2 | 12.7 | 20.0 | 100.0 |
| Wyoming | | | | 100.0 | | | 100.0 |
| Total | 6.5 | 13.4 | 19.1 | 28.0 | 19.2 | 13.8 | 100.0 |

[1] See table 21 for percentage of tonnage not reported.

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**TABLE 23.—Rail mine car haulage at bituminous coal and lignite underground mines in the United States, 1964, by States [1]**

| State | Production, by size of mine car reported | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 ton | 2 tons | 3 tons | 4–5 tons | 6–9 tons | 10 tons and over | Total |
| **NET TONS** | | | | | | | |
| Alabama | 56,970 | 27,211 | 12,202 | 2,328,088 | 2,998,533 | 176,853 | 5,599,857 |
| Arkansas | 39,000 | 5,107 | | | | | 44,107 |
| Colorado | 32,570 | 905,687 | 19,256 | 384,107 | 16,930 | 310,365 | 1,668,915 |
| Illinois | 193,060 | 547,088 | 164,176 | 1,105,995 | 3,959,417 | 2,296,086 | 8,265,822 |
| Indiana | 14,459 | 183,481 | 629,965 | 803,335 | 375,733 | | 2,006,973 |
| Iowa | 40,798 | 79,072 | 49,723 | | | | 169,593 |
| Kentucky | 179,814 | 2,472,963 | 1,849,936 | 5,941,055 | 2,423,702 | 5,614,859 | 18,482,329 |
| Maryland | 63,436 | 8,104 | 3,657 | | | | 75,197 |
| Missouri | 27,415 | | | | | | 27,415 |
| Montana: | | | | | | | |
| Bituminous | | 22,071 | 12,405 | 10,065 | | | 44,541 |
| Lignite | 3,383 | | | | | | 3,383 |
| Total Montana | 3,383 | 22,071 | 12,405 | 10,065 | | | 47,924 |
| New Mexico | 12,780 | 1,811 | | | | 397,574 | 412,165 |
| Ohio | 163,779 | 154,942 | 132,506 | 1,685,831 | 2,274,779 | 5,423,489 | 9,835,326 |
| Oklahoma | | 1,496 | 2,793 | | 1,036 | | 5,325 |
| Pennsylvania | 1,093,863 | 1,874,839 | 5,076,943 | 2,898,527 | 21,547,615 | 8,478,250 | 40,970,037 |
| Tennessee | 110,282 | 77,552 | 44,144 | 1,321,938 | | | 1,553,916 |
| Utah | | 17,338 | 177,905 | 2,234,346 | 1,408,377 | | 3,837,966 |
| Virginia | 104,518 | 355,772 | 2,003,953 | 1,384,336 | 644,301 | 1,394,796 | 5,887,676 |
| Washington | 3,153 | | | 55,914 | | | 59,067 |
| West Virginia | 203,543 | 2,410,724 | 11,058,116 | 23,810,529 | 14,168,527 | 37,257,924 | 88,909,363 |
| Wyoming | | | | 16,398 | | | 16,398 |
| Total | 2,342,823 | 9,145,258 | 21,237,680 | 43,980,464 | 49,818,950 | 61,350,196 | 187,875,371 |
| **PERCENTAGE OF TOTAL** | | | | | | | |
| Alabama | 1.0 | 0.5 | 0.2 | 41.6 | 53.5 | 3.2 | 100.0 |
| Arkansas | 88.4 | 11.6 | | | | | 100.0 |
| Colorado | 2.0 | 54.3 | 1.1 | 23.0 | 1.0 | 18.6 | 100.0 |
| Illinois | 2.3 | 6.6 | 2.0 | 13.4 | 47.9 | 27.8 | 100.0 |
| Indiana | .7 | 9.2 | 31.4 | 40.0 | 18.7 | | 100.0 |
| Iowa | 24.1 | 46.6 | 29.3 | | | | 100.0 |
| Kentucky | 1.0 | 13.4 | 10.0 | 32.1 | 13.1 | 30.4 | 100.0 |
| Maryland | 84.3 | 10.8 | 4.9 | | | | 100.0 |
| Missouri | 100.0 | | | | | | 100.0 |
| Montana: | | | | | | | |
| Bituminous | | 49.5 | 27.9 | 22.6 | | | 100.0 |
| Lignite | 100.0 | | | | | | 100.0 |
| Total Montana | 7.1 | 46.0 | 25.9 | 21.0 | | | 100.0 |
| New Mexico | 3.1 | .4 | | | | 96.5 | 100.0 |
| Ohio | 1.7 | 1.6 | 1.4 | 17.1 | 23.1 | 55.1 | 100.0 |
| Oklahoma | | 28.1 | 52.5 | | 19.4 | | 100.0 |
| Pennsylvania | 2.6 | 4.6 | 12.4 | 7.1 | 52.6 | 20.7 | 100.0 |
| Tennessee | 7.1 | 5.0 | 2.8 | 85.1 | | | 100.0 |
| Utah | | .5 | 4.6 | 58.2 | 36.7 | | 100.0 |
| Virginia | 1.8 | 6.0 | 34.0 | 23.5 | 11.0 | 23.7 | 100.0 |
| Washington | 5.3 | | | 94.7 | | | 100.0 |
| West Virginia | .2 | 2.7 | 12.5 | 26.8 | 15.9 | 41.9 | 100.0 |
| Wyoming | | | | 100.0 | | | 100.0 |
| Total | 1.3 | 4.9 | 11.3 | 23.4 | 26.5 | 32.6 | 100.0 |

[1] See table 21 for percentage of tonnage not reported.

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**TABLE 24.—Rubber-tired mine cars used at bituminous coal and lignite underground mines in the United States, 1964, by States [1]**

| State | Capacity | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 ton | 2 tons | 3 tons | 4–5 tons | 6–9 tons | 10 tons and over | Total |
| **NUMBER REPORTED** | | | | | | | |
| Kentucky | 635 | 493 | 234 | 109 | 2 | 5 | 1,478 |
| Maryland | | 14 | | | | | 14 |
| Ohio | 2 | 15 | | | | | 17 |
| Pennsylvania | 46 | 93 | 36 | | 4 | | 179 |
| Tennessee | 8 | 51 | | | | | 59 |
| Utah | | | | 1 | | | 1 |
| Virginia | 941 | 1,891 | 332 | 147 | 15 | 11 | 3,337 |
| West Virginia | 254 | 1,062 | 203 | 71 | 20 | | 1,610 |
| Total | 1,886 | 3,619 | 805 | 328 | 41 | 16 | 6,695 |
| **PERCENTAGE OF TOTAL** | | | | | | | |
| Kentucky | 43.0 | 33.4 | 15.8 | 7.4 | 0.1 | 0.3 | 100.0 |
| Maryland | | 100.0 | | | | | 100.0 |
| Ohio | 11.8 | 88.2 | | | | | 100.0 |
| Pennsylvania | 25.7 | 52.0 | 20.1 | | 2.2 | | 100.0 |
| Tennessee | 13.6 | 86.4 | | | | | 100.0 |
| Utah | | | | 100.0 | | | 100.0 |
| Virginia | 28.2 | 56.7 | 10.0 | 4.4 | .4 | .3 | 100.0 |
| West Virginia | 15.8 | 66.0 | 12.6 | 4.4 | 1.2 | | 100.0 |
| Total | 28.2 | 54.1 | 12.0 | 4.9 | .6 | .2 | 100.0 |

[1] See table 21 for percentage of tonnage not reported.

**TABLE 25.—Rubber-tired mine car haulage at bituminous coal and lignite underground mines in the United States, 1964, by States [1]**

| State | Production, by size of mine car reported | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 ton | 2 tons | 3 tons | 4–5 tons | 6–9 tons | 10 tons and over | Total |
| **NET TONS** | | | | | | | |
| Kentucky | 2,667,617 | 1,577,767 | 1,068,828 | 911,138 | 30,546 | 18,733 | 6,274,629 |
| Maryland | | 50,370 | | | | | 50,370 |
| Ohio | 1,417 | 23,502 | | | | | 24,919 |
| Pennsylvania | 63,248 | 77,873 | 67,612 | | 5,379 | | 214,112 |
| Tennessee | 6,269 | 82,445 | | | | | 88,714 |
| Utah | | | | 10,555 | | | 10,555 |
| Virginia | 1,783,382 | 3,538,935 | 863,571 | 502,733 | 52,670 | 30,981 | 6,772,272 |
| West Virginia | 979,330 | 2,402,848 | 682,566 | 88,833 | 110,673 | | 4,264,250 |
| Total | 5,501,263 | 7,753,740 | 2,682,577 | 1,513,259 | 199,268 | 49,714 | 17,699,821 |
| **PERCENTAGE OF TOTAL** | | | | | | | |
| Kentucky | 42.5 | 25.2 | 17.0 | 14.5 | 0.5 | 0.3 | 100.0 |
| Maryland | | 100.0 | | | | | 100.0 |
| Ohio | 5.7 | 94.3 | | | | | 100.0 |
| Pennsylvania | 29.5 | 36.4 | 31.6 | | 2.5 | | 100.0 |
| Tennessee | 7.1 | 92.9 | | | | | 100.0 |
| Utah | | | | 100.0 | | | 100.0 |
| Virginia | 26.3 | 52.3 | 12.7 | 7.4 | .8 | .5 | 100.0 |
| West Virginia | 23.0 | 56.3 | 16.0 | 2.1 | 2.6 | | 100.0 |
| Total | 31.1 | 43.8 | 15.2 | 8.5 | 1.1 | .3 | 100.0 |

[1] See table 21 for percentage of tonnage not reported.

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**TABLE 26.—Number and production of underground bituminous coal and lignite mines using gathering and haulage conveyors, and number and length of units in use in the United States [1]**

| Year | Number of mines | Production (net tons) | Number of units in use | Average length (feet) | Total length (miles) |
|---|---|---|---|---|---|
| 1945 | 117 | 40,189,857 | 359 | 1,438 | 97.6 |
| 1946 | 161 | 46,022,710 | 457 | 1,484 | 128.5 |
| 1947 | 199 | 70,690,920 | 594 | 1,470 | 165.3 |
| 1948 | 270 | 81,821,361 | 755 | 1,460 | 208.8 |
| 1949 | 314 | 69,947,713 | 860 | 1,514 | 246.7 |
| 1950 | 374 | 92,413,644 | 1,013 | 1,538 | 294.9 |
| 1951 | 372 | 99,643,003 | 1,094 | 1,568 | 325.0 |
| 1952 | 358 | 92,168,992 | 1,066 | 1,526 | 308.2 |
| 1953 | 322 | 100,155,249 | 1,042 | 1,541 | 303.9 |
| 1954 | 291 | 83,211,284 | 1,081 | 1,626 | 32.9 |
| 1955 | 314 | 97,677,313 | 1,002 | 1,682 | 319.6 |
| 1956 | 314 | 126,717,518 | 1,114 | 1,656 | 349.4 |
| 1957 | 362 | 136,914,192 | 1,233 | 1,672 | 390.4 |
| 1958 | 366 | 115,419,740 | 1,235 | 1,711 | 400.3 |
| 1959 | 371 | 126,654,911 | 1,416 | 1,723 | 462.1 |
| 1960 | 396 | 137,053,564 | 1,566 | 1,673 | 499.2 |
| 1961 | 414 | 140,938,297 | 1,635 | 1,655 | 512.6 |
| 1962 | 430 | 153,251,478 | 1,786 | 1,659 | 561.2 |
| 1963 | 494 | 173,999,774 | 1,998 | 1,656 | 626.9 |
| 1964 | 503 | 194,389,009 | 2,150 | 1,598 | 650.7 |

[1] Includes all gathering and haulage conveyors with capacity over 500 feet, except main-slope conveyors. Excludes lignite and Virginia semianthracite mines in 1945–49.

**TABLE 27.—Number and production of underground bituminous coal and lignite mines using gathering and haulage conveyors, and number and length of units in use in the United States, by States [1]**

| State | Number of mines | | Production (net tons) | | Number of units in use | | Average length (feet) | | Total length (miles) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Alabama | 7 | 7 | 5,470,917 | 5,827,668 | 69 | 65 | 2,073 | 2,247 | 27.1 | 27.7 |
| Colorado | 6 | 7 | 1,352,627 | 1,850,781 | 21 | 25 | 1,412 | 1,594 | 5.6 | 7.5 |
| Illinois | 16 | 17 | 22,258,377 | 23,094,950 | 141 | 146 | 2,242 | 2,213 | 59.9 | 61.2 |
| Indiana | 6 | 6 | 3,325,843 | 2,649,773 | 28 | 19 | 1,218 | 1,363 | 6.5 | 4.9 |
| Kentucky | 46 | 43 | 20,444,585 | 19,884,177 | 197 | 199 | 1,814 | 1,489 | 67.7 | 56.1 |
| Maryland | 2 | 2 | 135,236 | 150,942 | 3 | 8 | 1,540 | 1,050 | .9 | 1.6 |
| New Mexico | 1 | 1 | 293,371 | 397,574 | 1 | 1 | 1,500 | 1,500 | .3 | .3 |
| Ohio | 16 | 15 | 8,035,426 | 8,194,296 | 56 | 60 | 1,218 | 1,242 | 12.9 | 14.1 |
| Pennsylvania | 75 | 94 | 24,889,177 | 31,813,034 | 403 | 477 | 1,599 | 1,468 | 122.0 | 132.6 |
| Tennessee | 5 | 1 | 204,449 | 30,000 | 7 | 1 | 1,333 | 1,500 | 1.8 | .3 |
| Utah | 19 | 20 | 3,653,148 | 4,080,070 | 51 | 63 | 1,067 | 1,072 | 10.3 | 12.8 |
| Virginia | 16 | 12 | 8,885,724 | 8,363,077 | 97 | 93 | 2,210 | 2,178 | 40.6 | 38.4 |
| West Virginia | 278 | 277 | 75,012,690 | 88,036,269 | 921 | 990 | 1,550 | 1,559 | 270.4 | 292.3 |
| Wyoming | 1 | 1 | 38,204 | 16,398 | 3 | 3 | 1,500 | 1,500 | .9 | .9 |
| Total | 494 | 503 | 173,999,774 | 194,389,009 | 1,998 | 2,150 | 1,656 | 1,598 | 626.9 | 650.7 |

[1] Includes all mines using belt conveyors, 500 feet long or more for transporting coal underground. Excludes main-slope conveyors.

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## STRIP MINING

Strip mines have two substantial advantages over underground mines: (1) The output per man per day in strip mines is more than double that in underground mines, and (2) the average value of strip coal, f.o.b. mines, is about one-third less than the average value of coal from underground mines. See figures 9 and 10.

The rapid growth of strip mining was made possible by the development of larger and improved stripping and drilling equipment and trucks.

An increase in the average capacity of trucks used in strip mines has reduced the number required. The average hauling distance from strip mines to tipples or ramps is approximately 5 miles.

The average thickness of overburden at all bituminous coal and lignite strip mines in the United States was 46 feet in 1960, the latest year for which figures are available. Several strip mines handled an average of more than 70 feet of overburden in 1960, and a few handled more than 80 feet.

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**TABLE 28.—Growth of strip mining at bituminous coal and lignite mines in the United States, compared with underground and auger mining**

| Year | Production (thousand net tons) | | | | Percentage of total mined by stripping | Average tons per man per day | | | | Average value per ton f.o.b. mine | | | | Number of strip mines | Number of power shovels and draglines |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Underground mines | Strip mines [1] | Auger mines | Total | | Underground mines | Strip mines [1] | Auger mines | Total | Underground mines | Strip mines [1] | Auger mines | Total | | |
| 1914 | 421,423 | 1,281 | | 422,704 | 0.3 | 3.71 | 5.06 | | 3.71 | NA | NA | | $1.17 | [2] 35 | 48 |
| 1915 | 439,792 | 2,832 | | 442,624 | .6 | 3.90 | 5.81 | | 3.91 | $1.13 | $1.18 | | 1.13 | [2] 60 | 87 |
| 1916 | 498,587 | 3,933 | | 502,520 | .8 | 3.88 | 6.67 | | 3.90 | 1.32 | 1.51 | | 1.32 | [2] 79 | 111 |
| 1917 | 546,001 | 5,790 | | 551,791 | 1.0 | 3.75 | 6.52 | | 3.77 | 2.26 | 2.34 | | 2.26 | [2] 126 | 182 |
| 1918 | 571,098 | 8,288 | | 579,386 | 1.4 | 3.76 | 6.81 | | 3.78 | 2.58 | 2.54 | | 2.58 | [2] 165 | 276 |
| 1919 | 460,225 | 5,635 | | 465,860 | 1.2 | 3.82 | 6.21 | | 3.84 | 2.49 | 2.33 | | 2.49 | [2] 168 | 287 |
| 1920 | 559,807 | 8,860 | | 568,667 | 1.5 | 3.97 | 7.20 | | 4.00 | 3.74 | 4.12 | | 3.75 | [2] 174 | 312 |
| 1921 | 410,865 | 5,057 | | 415,922 | 1.2 | 4.18 | 8.28 | | 4.20 | 2.89 | 2.87 | | 2.89 | [2] 155 | 279 |
| 1922 | 412,059 | 10,209 | | 422,268 | 2.4 | 4.24 | 8.09 | | 4.28 | 3.02 | 3.07 | | 3.02 | 272 | 379 |
| 1923 | 552,625 | 11,940 | | 564,565 | 2.1 | 4.43 | 9.32 | | 4.47 | 2.69 | 2.31 | | 2.68 | 263 | 442 |
| 1924 | 470,080 | 13,607 | | 483,687 | 2.8 | 4.50 | 9.91 | | 4.56 | 2.20 | 2.00 | | 2.20 | 234 | 420 |
| 1925 | 503,182 | 16,871 | | 520,053 | 3.2 | 4.45 | 11.18 | | 4.52 | 2.05 | 1.84 | | 2.04 | 227 | 389 |
| 1926 | 556,444 | 16,923 | | 573,367 | 3.0 | 4.42 | 11.13 | | 4.50 | 2.07 | 1.89 | | 2.06 | 237 | 410 |
| 1927 | 499,385 | 18,378 | | 517,763 | 3.6 | 4.47 | 11.06 | | 4.55 | 1.99 | 1.90 | | 1.99 | 255 | 455 |
| 1928 | 480,956 | 19,789 | | 500,745 | 4.0 | 4.61 | 13.02 | | 4.73 | 1.87 | 1.69 | | 1.86 | 250 | 415 |
| 1929 | 514,721 | 20,268 | | 534,989 | 3.8 | 4.73 | 14.08 | | 4.85 | 1.79 | 1.57 | | 1.78 | 200 | 411 |
| 1930 | 447,684 | 19,842 | | 467,526 | 4.3 | 4.93 | 16.21 | | 5.06 | 1.71 | 1.54 | | 1.70 | 218 | 341 |
| 1931 | 363,157 | 18,932 | | 382,089 | 5.0 | 5.12 | 17.68 | | 5.30 | 1.54 | 1.51 | | 1.54 | 235 | 314 |
| 1932 | 290,069 | 19,641 | | 309,710 | 6.3 | 4.99 | 16.95 | | 5.22 | 1.31 | 1.32 | | 1.31 | 255 | 332 |
| 1933 | 315,360 | 18,270 | | 333,630 | 5.5 | 4.60 | 13.59 | | 4.78 | 1.34 | 1.33 | | 1.34 | 289 | 389 |
| 1934 | 338,578 | 20,790 | | 359,368 | 5.8 | 4.23 | 13.28 | | 4.40 | 1.76 | 1.49 | | 1.75 | 344 | 458 |
| 1935 | 348,726 | 23,647 | | 372,373 | 6.4 | 4.32 | 12.01 | | 4.50 | 1.79 | 1.47 | | 1.77 | 368 | 507 |
| 1936 | 410,962 | 28,126 | | 439,088 | 6.4 | 4.42 | 13.91 | | 4.62 | 1.77 | 1.49 | | 1.76 | 381 | 562 |
| 1937 | 413,780 | 31,751 | | 445,531 | 7.1 | NA | NA | | 4.69 | NA | NA | | 1.94 | 449 | NA |
| 1938 | 318,138 | 30,407 | | 348,545 | 8.7 | 4.60 | 15.00 | | 4.89 | NA | NA | | 1.95 | 465 | 737 |
| 1939 | 357,133 | 37,722 | | 394,855 | 9.6 | 4.92 | 14.68 | | 5.25 | 1.88 | 1.49 | | 1.84 | 537 | 914 |
| 1940 | 417,604 | 43,167 | | 460,771 | 9.4 | 4.86 | 15.63 | | 5.19 | 1.94 | 1.56 | | 1.91 | 638 | 1,071 |
| 1941 | 459,078 | 55,071 | | 514,149 | 10.7 | 4.83 | 15.59 | | 5.20 | 2.23 | 1.79 | | 2.19 | 769 | 1,321 |
| 1942 | 515,490 | 67,203 | | 582,693 | 11.5 | 4.74 | 15.52 | | 5.12 | 2.41 | 1.90 | | 2.36 | 834 | 1,438 |
| 1943 | 510,492 | 79,685 | | 590,177 | 13.5 | 4.89 | 15.15 | | 5.38 | 2.75 | 2.28 | | 2.69 | 1,004 | 1,839 |
| 1944 | 518,678 | 100,898 | | 619,576 | 16.3 | 5.04 | 15.89 | | 5.67 | 3.01 | 2.48 | | 2.92 | 1,240 | 2,312 |

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| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1945 | 467,630 | 109,987 | ---------- | 577,617 | 19.0 | 5.04 | 15.46 | ---------- | 6.78 | 3.16 | 2.65 | ---------- | 3.00 | 1,370 | 2,439 |
| 1946 | 420,958 | 112,994 | ---------- | 533,922 | 21.1 | 5.43 | 15.73 | ---------- | 6.30 | 3.59 | 2.87 | ---------- | 3.44 | 1,445 | 2,744 |
| 1947 | 491,220 | 139,305 | ---------- | 630,524 | 22.1 | 5.49 | 15.63 | ---------- | 6.42 | 4.35 | 3.47 | ---------- | 4.16 | 1,750 | 3,254 |
| 1948 | 440,012 | 130,506 | ---------- | 570,518 | 23.8 | 5.31 | 15.28 | ---------- | 6.26 | 5.26 | 4.11 | ---------- | 4.99 | 1,971 | 3,712 |
| 1949 | 331,823 | 106,045 | ---------- | 437,868 | 24.2 | 5.42 | 15.33 | ---------- | 6.43 | 5.18 | 3.94 | ---------- | 4.88 | 1,761 | 3,576 |
| 1950 | 392,844 | 123,467 | ---------- | 516,311 | 23.9 | 5.75 | 15.66 | ---------- | 6.77 | 5.15 | 3.87 | ---------- | 4.84 | 1,870 | 3,877 |
| 1951 | 415,842 | 117,618 | 205 | 533,665 | 22.0 | 6.08 | 16.02 | ---------- | 7.04 | 5.21 | 3.88 | ---------- | 4.92 | 1,784 | 3,810 |
| 1952 | 356,425 | 108,910 | 1,506 | 466,841 | 23.8 | 6.37 | 16.77 | 20.07 | 7.47 | 5.24 | 3.81 | $4.31 | 4.90 | 1,643 | 3,627 |
| 1953 | 340,551 | 105,448 | 2,291 | 447,290 | 23.1 | 7.01 | 17.62 | 25.30 | 8.17 | 5.27 | 3.75 | 4.15 | 4.92 | 1,554 | 3,390 |
| 1954 | 288,112 | 98,134 | 4,460 | 391,706 | 25.1 | 7.99 | 19.64 | 24.12 | 9.47 | 4.87 | 3.52 | 3.41 | 4.52 | 1,329 | 3,409 |
| 1955 | 343,465 | 115,093 | 6,075 | 464,633 | 24.8 | 8.28 | 21.12 | 22.22 | 9.84 | 4.86 | 3.48 | 3.60 | 4.50 | 1,617 | 3,265 |
| 1956 | 365,774 | 127,055 | 8,045 | 500,874 | 25.4 | 8.62 | 21.18 | 24.85 | 10.28 | 5.20 | 3.74 | 4.17 | 4.82 | 1,728 | 3,705 |
| 1957 | 360,649 | 124,109 | 7,946 | 492,704 | 25.2 | 8.91 | 21.64 | 26.19 | 10.59 | 5.52 | 3.89 | 4.12 | 5.06 | 1,756 | 3,723 |
| 1958 | 286,884 | 116,242 | 7,320 | 410,446 | 28.3 | 9.38 | 21.84 | 28.15 | 11.33 | 5.33 | 3.80 | 3.60 | 4.86 | 1,646 | 3,515 |
| 1959 | 283,434 | 120,953 | 7,641 | 412,028 | 29.4 | 10.08 | 22.65 | 28.77 | 12.22 | 5.23 | 3.76 | 3.83 | 4.77 | 1,594 | 3,417 |
| 1960 | 284,888 | 122,630 | 7,994 | 415,512 | 29.5 | 10.64 | 22.93 | 31.36 | 12.83 | 5.14 | 3.74 | 3.37 | 4.69 | 1,530 | 3,313 |
| 1961 | 272,766 | 121,979 | 8,232 | 402,977 | 30.3 | 11.41 | 25.00 | 30.61 | 13.87 | 5.02 | 3.67 | 3.24 | 4.58 | 1,477 | 3,204 |
| 1962 | 281,266 | 130,300 | 10,583 | 422,149 | 30.9 | 11.97 | 26.76 | 34.61 | 14.72 | 4.91 | 3.64 | 3.33 | 4.48 | 1,429 | 3,185 |
| 1963 | 302,256 | 144,141 | 12,531 | 458,928 | 31.4 | 12.78 | 28.09 | 38.87 | 15.83 | 4.82 | 3.57 | 3.25 | 4.39 | 1,431 | 3,254 |
| 1964 | 321,808 | 151,859 | 13,331 | 486,998 | 31.2 | 13.74 | 29.29 | 42.63 | 16.84 | 4.92 | 3.55 | 3.35 | 4.45 | 1,455 | 3,192 |

N.A. Not available.
[1] Includes power strip pits proper and excludes horse stripping operations and mines combining stripping and underground in the same operation for the period 1914–42. The years 1943–64 include data on all strip mines.
[2] Exclusive of horse stripping operations.

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**TABLE 29.—Number and production of bituminous coal and lignite strip mines and units of stripping and loading equipment in use in the United States**

| Year | Number of strip mines | Production (thousand net tons) | Number of power shovels and dragline excavators | | | | | | | | | | | Number of carry-all scrapers | Number of bull-dozers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | By type of power | | | | | By capacity of dipper or bucket, cubic yards | | | | By type of machine | | Total | |
| | | | Electric | Diesel-electric | Diesel | Gasoline | Steam | Less than 3 | 3-5 | 6-12 | More than 12 | Power shovels | Dragline excavators | | |
| 1932 | 255 | 19,641 | [1] 105 | (2) | [3] 61 | (4) | 166 | NA | NA | NA | NA | NA | NA | 332 | NA | NA |
| 1933 | 289 | 18,270 | [1] 117 | (2) | [3] 103 | (4) | 169 | NA | NA | NA | NA | NA | NA | 389 | NA | NA |
| 1934 | 344 | 20,790 | [1] 121 | (2) | [3] 149 | (4) | 188 | NA | NA | NA | NA | NA | NA | 458 | NA | NA |
| 1935 | 368 | 23,647 | [1] 139 | (2) | [3] 194 | (4) | 174 | NA | NA | NA | NA | NA | NA | 507 | NA | NA |
| 1936 | 381 | 28,126 | [1] 151 | (2) | [3] 223 | (4) | 188 | NA | NA | NA | NA | NA | NA | 562 | NA | NA |
| 1937 | 449 | 31,751 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 1938 | 465 | 30,407 | [1] 155 | (2) | [3] 440 | (4) | 142 | NA | NA | NA | NA | NA | NA | 737 | NA | NA |
| 1939 | 537 | 37,722 | [1] 184 | (2) | [3] 524 | (4) | 206 | NA | NA | NA | NA | NA | NA | 914 | NA | NA |
| 1940 | 638 | 43,167 | [1] 194 | (2) | [3] 697 | (4) | 180 | NA | NA | NA | NA | NA | NA | 1,071 | NA | NA |
| 1941 | 769 | 55,071 | [1] 210 | (2) | [3] 911 | (4) | 200 | 1,009 | 153 | 95 | 64 | NA | NA | 1,321 | NA | NA |
| 1942 | 834 | 67,203 | [1] 219 | (2) | [3] 1,020 | (4) | 199 | 1,114 | 159 | 97 | 68 | NA | NA | 1,438 | NA | NA |
| 1943 | 1,004 | 79,685 | [1] 234 | (2) | [3] 1,433 | (4) | 172 | 1,488 | 173 | 106 | 72 | NA | NA | 1,839 | NA | NA |
| 1944 | 1,240 | 100,898 | [1] 244 | (2) | [3] 1,902 | (4) | 166 | 1,900 | 225 | 113 | 74 | NA | NA | 2,312 | NA | NA |
| 1945 | 1,370 | 109,987 | [1] 256 | (2) | [3] 2,042 | (4) | 141 | 2,004 | 243 | 117 | 75 | NA | NA | 2,439 | NA | NA |
| 1946 | 1,445 | 112,964 | [1] 261 | (2) | 1,619 | 753 | 111 | 2,256 | 302 | 112 | 74 | 2,406 | 338 | 2,744 | 263 | NA |
| 1947 | 1,750 | 139,395 | [1] 301 | (2) | 2,279 | 591 | 83 | 2,685 | 362 | 123 | 84 | 2,822 | 432 | 3,254 | 275 | NA |
| 1948 | 1,971 | 139,506 | [1] 337 | (2) | 2,675 | 646 | 54 | 3,048 | 446 | 130 | 88 | 3,177 | 535 | 3,712 | 362 | NA |
| 1949 | 1,761 | 106,045 | [1] 352 | (2) | 2,646 | 527 | 51 | 2,931 | 367 | 168 | 110 | 3,011 | 565 | 3,576 | 320 | NA |
| 1950 | 1,870 | 123,467 | [1] 348 | (2) | 2,880 | 607 | 42 | 3,182 | 416 | 170 | 109 | 3,247 | 630 | 3,877 | 286 | NA |
| 1951 | 1,784 | 117,618 | [1] 346 | (2) | 2,905 | 533 | 26 | 3,088 | 420 | 187 | 115 | 3,164 | 646 | 3,810 | 220 | NA |
| 1952 | 1,643 | 108,910 | [1] 321 | (2) | 2,642 | 545 | 19 | 2,800 | 425 | 183 | 119 | 2,892 | 635 | 3,527 | 218 | NA |
| 1953 | 1,554 | 105,448 | [1] 317 | (2) | 2,629 | 446 | 17 | 2,692 | 413 | 193 | 111 | 2,793 | 616 | 3,409 | 244 | 1,954 |
| 1954 | 1,329 | 98,134 | [1] 381 | (2) | 2,617 | 374 | 18 | 2,480 | 579 | 211 | 120 | 2,605 | 785 | 3,390 | 269 | 2,599 |
| 1955 | 1,617 | 115,093 | [1] 315 | (2) | 2,603 | 337 | 10 | 2,381 | 550 | 223 | 111 | 2,592 | 673 | 3,265 | 187 | 2,106 |
| 1956 | 1,728 | 127,055 | 285 | 136 | 2,914 | 365 | 5 | 2,693 | 634 | 249 | 129 | 2,899 | 806 | 3,705 | 226 | 2,381 |
| 1957 | 1,756 | 124,109 | 325 | 164 | 2,839 | 389 | 6 | 2,748 | 566 | 266 | 143 | 2,894 | 829 | 3,723 | 215 | 2,499 |
| 1958 | 1,646 | 116,242 | 315 | 273 | 2,607 | 315 | 5 | 2,507 | 591 | 275 | 142 | 2,704 | 811 | 3,515 | 173 | 2,472 |
| 1959 | 1,594 | 120,953 | 309 | 215 | 2,579 | 307 | 7 | 2,435 | 572 | 267 | 143 | 2,607 | 810 | 3,417 | 161 | 2,443 |
| 1960 | 1,530 | 122,630 | 311 | 194 | 2,519 | 285 | 4 | 2,315 | 588 | 265 | 145 | 2,521 | 792 | 3,313 | 163 | 2,345 |
| 1961 | 1,477 | 121,979 | 286 | 210 | 2,455 | 253 | (5) | 2,162 | 606 | 299 | 137 | 2,412 | 792 | 3,204 | 152 | 2,341 |
| 1962 | 1,429 | 130,300 | 296 | 214 | 2,423 | 252 | (5) | 2,111 | 597 | 335 | 142 | 2,353 | 832 | 3,185 | 146 | 2,330 |
| 1963 | 1,431 | 144,141 | 304 | 213 | 2,503 | 234 | (6) | 2,101 | 627 | 372 | 154 | 2,409 | 845 | 3,254 | 163 | 2,430 |
| 1964 | 1,455 | 151,859 | 315 | 146 | 2,540 | 191 | (6) | 2,045 | 599 | 381 | 167 | 2,352 | 840 | 3,192 | 148 | 2,441 |

NA Not available.
[1] Includes diesel-electric shovels.
[2] Included with electric shovels.
[3] Includes gasoline shovels.
[4] Included with diesel shovels.
[5] Canvass discontinued.

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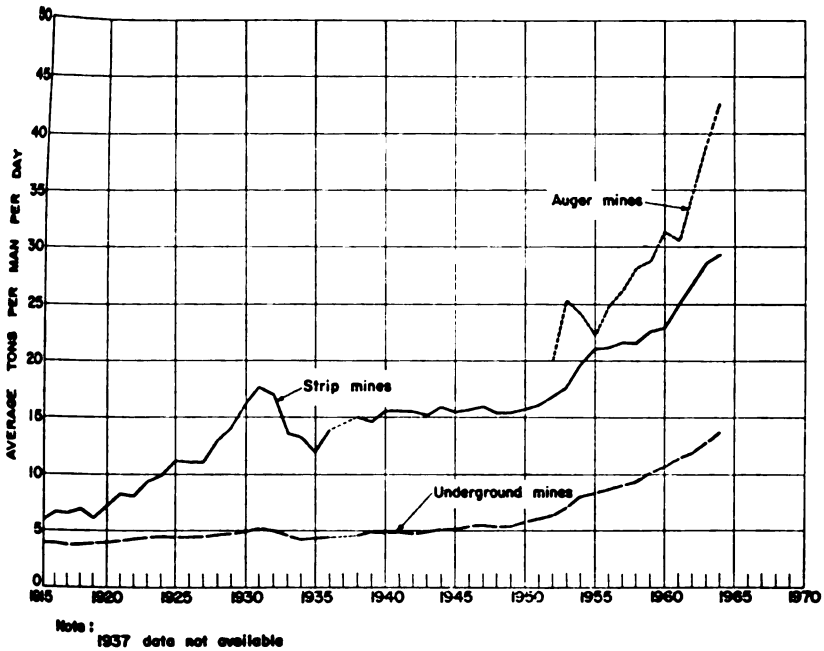


FIGURE 9.—Average tons per man per day at bituminous coal and lignite mines in the United States, 1915–64, by underground, strip and auger mines.

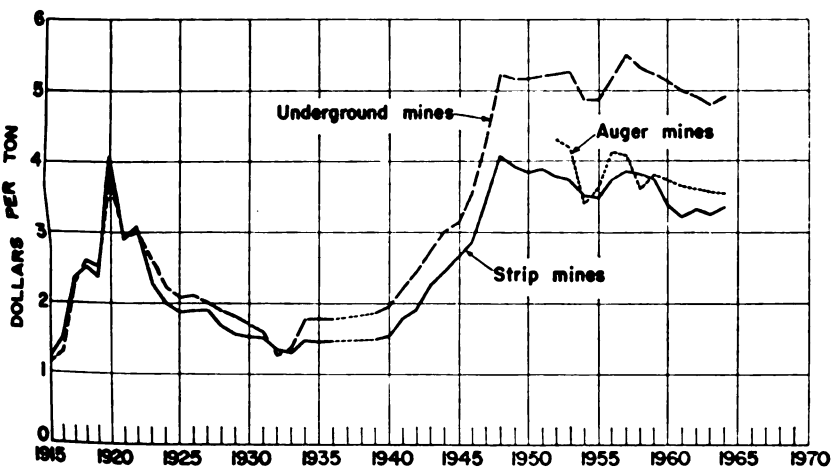


FIGURE 10.—Average value per ton, f.o.b. mines, of bituminous coal and lignite produced in the United States, 1915–64, by underground, strip, and auger mines.

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**TABLE 30.—Number and production of bituminous coal and lignite strip mines and units of stripping and loading equipment in use in the United States, 1964, by States**

| State | Number of strip mines | Production (net tons) | Number of power shovels and dragline excavators | | | | | | | | | | | Number of carryall scrapers | Number of bulldozers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | By type of power | | | | By capacity of dipper or bucket, cubic yards | | | | By type of machine | | Total | | |
| | | | Electric | Diesel electric | Diesel | Gasoline | Less than 3 | 3–5 | 6–12 | More than 12 | Power shovels | Dragline excavators | | | |
| Alabama | 51 | 3,878,014 | 8 | 2 | 93 | 2 | 65 | 17 | 15 | 8 | 86 | 19 | 105 | 5 | 93 |
| Alaska | 5 | 744,942 | | | 13 | | 6 | 6 | 1 | | 11 | 2 | 13 | 4 | 24 |
| Arkansas | 6 | 138,431 | | 4 | 5 | | 6 | 1 | 2 | | 3 | 6 | 9 | | 9 |
| Colorado | 9 | 945,907 | 4 | 1 | 8 | | 3 | 6 | 3 | 1 | 7 | 6 | 13 | 2 | 14 |
| Illinois | 57 | 29,988,126 | 97 | 7 | 66 | 3 | 30 | 34 | 54 | 55 | 107 | 66 | 173 | | 121 |
| Indiana | 37 | 11,621,654 | 43 | 4 | 36 | 12 | 35 | 22 | 21 | 17 | 55 | 40 | 95 | 4 | 84 |
| Iowa | 21 | 803,621 | 1 | 1 | 35 | 6 | 29 | 11 | 3 | | 26 | 17 | 43 | 4 | 34 |
| Kansas | 7 | 1,263,409 | 8 | 4 | 6 | 1 | 9 | 2 | 4 | 4 | 11 | 8 | 19 | | 8 |
| Kentucky: | | | | | | | | | | | | | | | |
| Eastern | 65 | 3,129,677 | | 2 | 93 | 5 | 82 | 12 | 6 | | 94 | 6 | 100 | 4 | 72 |
| Western | 48 | 25,175,191 | 43 | 6 | 72 | 4 | 46 | 26 | 30 | 23 | 95 | 30 | 125 | 4 | 118 |
| Total Kentucky | 113 | 28,304,868 | 43 | 8 | 165 | 9 | 128 | 38 | 36 | 23 | 189 | 36 | 225 | 8 | 190 |
| Maryland | 32 | 750,311 | | 1 | 43 | 10 | 46 | 6 | 2 | | 44 | 10 | 54 | 3 | 30 |
| Missouri | 16 | 3,220,743 | 13 | 1 | 19 | 7 | 19 | 8 | 6 | 7 | 24 | 16 | 40 | 5 | 38 |
| Montana: | | | | | | | | | | | | | | | |
| Bituminous | 1 | 1,365 | | | | 1 | | 1 | | | 1 | | 1 | | 1 |
| Lignite | 1 | 294,082 | 1 | | 1 | | | 1 | 1 | | 1 | 1 | 2 | 1 | 1 |
| Total Montana | 2 | 295,447 | 1 | | 1 | 1 | | 2 | 1 | | 2 | 1 | 3 | 1 | 2 |
| New Mexico | 3 | 2,551,172 | 5 | | 3 | | 1 | | 4 | 3 | 6 | 2 | 8 | | 7 |
| North Dakota (lignite) | 28 | 2,634,884 | 20 | 2 | 16 | 8 | 23 | 12 | 9 | 2 | 36 | 10 | 46 | 22 | 39 |
| Ohio | 255 | 24,815,302 | 44 | 21 | 485 | 37 | 363 | 132 | 65 | 27 | 432 | 155 | 587 | 35 | 486 |
| Oklahoma | 12 | 1,017,253 | 7 | 4 | 7 | | 5 | 7 | 2 | 4 | 10 | 8 | 18 | 1 | 14 |
| Pennsylvania | 510 | 23,505,457 | 13 | 61 | 1,083 | 84 | 882 | 219 | 127 | 13 | 839 | 402 | 1,241 | 19 | 814 |
| South Dakota (lignite) | 1 | 13,000 | | | 2 | | 1 | 1 | | | 1 | 1 | 2 | 1 | 1 |
| Tennessee | 47 | 2,071,994 | | 6 | 88 | | 79 | 7 | 7 | 1 | 89 | 5 | 94 | | 67 |
| Virginia | 44 | 2,450,755 | | 1 | 59 | | 51 | 9 | | | 60 | | 60 | 4 | 67 |
| Washington | | | | | | | | | | | | | | | |
| West Virginia | 188 | 7,867,872 | 2 | 18 | 295 | 8 | 253 | 53 | 16 | 1 | 299 | 24 | 323 | 10 | 279 |
| Wyoming | 11 | 2,975,817 | 6 | | 12 | 3 | 11 | 6 | 3 | 1 | 15 | 6 | 21 | 20 | 20 |
| Total | 1,455 | 151,858,979 | 315 | 146 | 2,540 | 191 | 2,045 | 599 | 381 | 167 | 2,352 | 840 | 3,192 | 148 | 2,441 |

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**TABLE 31.—Bituminous coal lignite strip mines using power drills in bank or overburden in the United States**

| Year | Number of mines | Production | | Number of power drills | | |
|---|---|---|---|---|---|---|
| | | Quantity (net tons) | Percentage of total | Horizontal | Vertical | Total |
| 1946 | 514 | 75,375,841 | 66.7 | NA | NA | 764 |
| 1947 | 598 | 95,915,346 | 68.8 | NA | NA | 875 |
| 1948 | 728 | 98,809,393 | 72.3 | NA | NA | 1,195 |
| 1949 | 756 | 78,146,655 | 73.7 | NA | NA | 1,256 |
| 1950 | 692 | 87,205,280 | 70.6 | NA | NA | 1,201 |
| 1951 | 650 | 85,331,204 | 72.5 | 737 | 388 | 1,125 |
| 1952 | 629 | 79,252,284 | 73.0 | 685 | 385 | 1,070 |
| 1953 | 603 | 80,259,365 | 76.1 | 639 | 409 | 1,048 |
| 1954 | 541 | 70,107,205 | 71.4 | 592 | 391 | 983 |
| 1955 | 564 | 85,623,050 | 74.4 | 582 | 371 | 953 |
| 1956 | 696 | 96,278,779 | 75.8 | 652 | 389 | 1,041 |
| 1957 | 722 | 96,418,089 | 77.7 | 640 | 464 | 1,104 |
| 1958 | 737 | 91,659,662 | 78.9 | 615 | 464 | 1,079 |
| 1959 | 697 | 95,716,153 | 79.1 | 580 | 487 | 1,067 |
| 1960 | 714 | 96,660,466 | 78.8 | 551 | 498 | 1,049 |
| 1961 | 650 | 92,135,940 | 75.5 | 495 | 449 | 944 |
| 1962 | 636 | 100,901,554 | 77.4 | 456 | 461 | 917 |
| 1963 | 613 | 108,424,525 | 75.2 | 414 | 459 | 873 |
| 1964 | 670 | 119,312,811 | 78.6 | 395 | 504 | 899 |

NA Not available.

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**TABLE 32.—Bituminous coal and lignite strip mines using power drills in bank or overburden in the United States, by States**

| State | Number of mines | | Production | | | | Number of power drills | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Quantity (net tons) | | Percentage of total strip production | | Horizontal | | Vertical | | Total | |
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Alabama | 22 | 27 | 1,921,897 | 2,515,868 | 68.8 | 64.9 | 10 | 10 | 18 | 24 | 28 | 34 |
| Alaska | 5 | 5 | 853,398 | 504,569 | 100.0 | 67.7 | 3 | 3 | 5 | 4 | 8 | 7 |
| Arkansas | 3 | 5 | 124,686 | 132,988 | 85.7 | 96.1 | 2 | 1 | 2 | 4 | 4 | 5 |
| Colorado | 4 | 5 | 817,188 | 921,921 | 95.4 | 97.5 | 4 | 4 | 5 | 5 | 9 | 9 |
| Illinois | 37 | 37 | 21,074,807 | 23,147,270 | 77.2 | 77.2 | 28 | 23 | 25 | 30 | 53 | 53 |
| Indiana | 26 | 28 | 10,670,623 | 11,424,452 | 97.5 | 98.3 | 18 | 18 | 19 | 20 | 37 | 38 |
| Iowa | 17 | 15 | 1,050,612 | 738,919 | 99.5 | 91.9 | 17 | 15 | 13 | 11 | 30 | 26 |
| Kansas | 7 | ---- | 1,162,342 | 1,263,409 | 99.6 | 100.0 | 10 | 11 | 3 | 3 | 13 | 14 |
| Kentucky: | | | | | | | | | | | | |
| Eastern | 21 | 22 | 1,100,786 | 1,203,545 | 38.7 | 38.5 | 11 | 19 | 5 | 9 | 16 | 28 |
| Western | 22 | 28 | 19,955,852 | 24,334,625 | 87.1 | 96.7 | 12 | 10 | 33 | 39 | 45 | 49 |
| Total Kentucky | 43 | 50 | 21,056,638 | 25,538,170 | 81.8 | 90.2 | 23 | 29 | 38 | 48 | 61 | 77 |
| Maryland | 3 | 7 | 184,910 | 408,504 | 25.1 | 54.4 | 1 | 1 | 2 | 3 | 3 | 4 |
| Missouri | 11 | 12 | 3,072,054 | 3,188,185 | 97.9 | 99.0 | 15 | 12 | ---- | 5 | 15 | 17 |
| Montana: | | | | | | | | | | | | |
| Bituminous | 1 | 1 | 3,000 | 1,365 | 100.0 | 100.0 | 1 | ---- | ---- | 1 | 1 | 1 |
| Lignite | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Total Montana | 1 | 1 | 3,000 | 1,365 | 1.0 | .5 | 1 | ---- | ---- | 1 | 1 | 1 |
| New Mexico | 3 | 3 | 1,631,448 | 2,551,172 | 100.0 | 100.0 | 2 | 2 | 2 | 1 | 4 | 3 |
| North Dakota (lignite) | 5 | 4 | 727,796 | 908,801 | 30.4 | 34.5 | 3 | 1 | 4 | 4 | 7 | 5 |
| Ohio | 108 | 121 | 18,453,908 | 19,453,741 | 75.6 | 78.4 | 61 | 63 | 102 | 106 | 163 | 169 |
| Oklahoma | 11 | 12 | 936,341 | 943,804 | 98.1 | 92.8 | 6 | 6 | 6 | 5 | 12 | 11 |
| Pennsylvania | 189 | 208 | 13,368,578 | 14,939,628 | 54.6 | 63.6 | 116 | 102 | 129 | 146 | 245 | 248 |
| Tennessee | 18 | 18 | 1,066,938 | 964,198 | 42.8 | 46.5 | 19 | 16 | 7 | 8 | 26 | 24 |
| Virginia | 12 | 12 | 1,447,282 | 1,543,688 | 62.9 | 63.0 | 10 | 10 | 6 | 8 | 16 | 18 |
| West Virginia | 79 | 93 | 5,861,049 | 5,462,818 | 78.7 | 69.4 | 60 | 64 | 65 | 59 | 125 | 123 |
| Wyoming | 9 | 7 | 2,939,030 | 2,759,341 | 97.8 | 92.7 | 5 | 4 | 8 | 9 | 13 | 13 |
| Total | 613 | 670 | 108,424,525 | 119,312,811 | 75.2 | 78.6 | 414 | 395 | 459 | 504 | 873 | 899 |

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**TABLE 33.—Method of haulage from bituminous coal and lignite strip mines to tipple or ramp, in the United States [1]**

| Year | Strip mines reporting method of haulage | | | | | | | Strip mines not reporting method of haulage—production (net tons) | Total strip production (net tons) |
|---|---|---|---|---|---|---|---|---|---|
| | Strip mines using trucks | | | | Strip mines using rail, rail and truck, truck and tram—production (net tons) | Strip production | | | |
| | Production (net tons) | Number of trucks | Average capacity per truck (net tons) | Average distance hauled (miles) | | Total (net tons) | Percentage of total | | |
| 1948 | 97,450,399 | 7,214 | 9.4 | 3.7 | 6,327,989 | 103,778,388 | 74.4 | 35,727,532 | 139,505,920 |
| 1949 | 73,229,556 | 6,694 | 10.1 | 3.7 | 5,365,432 | 78,594,988 | 74.1 | 27,450,311 | 106,045,299 |
| 1950 | 88,666,733 | 6,564 | 10.3 | 3.8 | 4,364,333 | 93,031,066 | 75.3 | 30,435,498 | 123,466,564 |
| 1951 | 87,427,029 | 6,173 | 10.6 | 4.0 | 2,424,994 | 89,852,023 | 76.4 | 27,765,653 | 117,617,676 |
| 1952 | 88,589,637 | 5,799 | 11.3 | 4.0 | 2,296,744 | 90,886,381 | 83.5 | 18,023,375 | 108,909,756 |
| 1953 | 84,764,694 | 5,287 | 12.2 | 4.0 | 2,104,609 | 86,869,303 | 82.4 | 18,579,266 | 105,448,569 |
| 1954 | 73,794,489 | 4,250 | 13.2 | 3.9 | 1,203,753 | 74,998,242 | 76.4 | 23,136,008 | 98,134,250 |
| 1955 | 94,150,171 | 4,798 | 13.3 | 3.9 | 2,290,600 | 96,440,771 | 83.9 | 18,651,998 | 115,092,769 |
| 1956 | 103,127,374 | 5,432 | 13.3 | 4.4 | 1,056,627 | 104,184,001 | 82.0 | 22,871,381 | 127,055,382 |
| 1957 | 104,796,728 | 5,532 | 14.0 | 4.3 | 164,311 | 104,961,039 | 84.6 | 19,147,499 | 124,108,538 |
| 1958 | 99,223,676 | 5,151 | 14.5 | 4.4 | 19,241 | 99,242,917 | 85.4 | 16,998,870 | 116,241,787 |
| 1959 | 102,706,819 | 4,959 | 15.3 | 4.6 | ---------- | 102,706,819 | 84.9 | 18,246,515 | 120,953,334 |
| 1960 | 104,099,974 | 4,855 | 15.5 | 4.8 | ---------- | 104,099,974 | 84.9 | 18,529,690 | 122,629,664 |
| 1961 | 101,951,989 | 4,407 | 16.5 | 4.4 | ---------- | 101,951,989 | 83.6 | 20,027,095 | 121,979,084 |
| 1962 | 109,846,339 | 4,309 | 17.7 | 4.9 | ---------- | 109,846,339 | 84.3 | 20,453,885 | 130,300,224 |
| 1963 | 119,681,295 | 4,314 | 18.5 | 4.7 | ---------- | 119,681,295 | 83.0 | 24,459,382 | 144,140,677 |
| 1964 | 132,209,971 | 4,462 | 19.5 | 4.7 | ---------- | 132,209,971 | 87.1 | 19,649,008 | 151,858,979 |

[1] Excludes lignite in 1948 and 1949.



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**TABLE 34.—Method of haulage from bituminous coal and lignite strip mines to tipple or ramp, in the United States, 1964, by States**

| State | Strip mines reporting method of haulage | | | | | Strip mines not reporting method of haulage—production (net tons) | Total strip production (net tons) |
|---|---|---|---|---|---|---|---|
| | Number of trucks | Average capacity per truck (net tons) | Average distance hauled (miles) | Production | | | |
| | | | | Net tons | Percentage of total production | | |
| Alabama | 112 | 20.4 | 3.8 | 2,420,350 | 62.4 | 1,457,664 | 3,878,014 |
| Alaska | 15 | 25.3 | 2.9 | 504,569 | 67.7 | 240,373 | 744,942 |
| Arkansas | 18 | 9.3 | 1.3 | 138,431 | 100.0 | ---- | 138,431 |
| Colorado | 24 | 19.0 | 1.9 | 929,607 | 98.3 | 16,300 | 945,907 |
| Illinois | 351 | 38.2 | 4.0 | 29,696,714 | 99.0 | 291,412 | 29,988,126 |
| Indiana | 143 | 32.4 | 4.1 | 11,427,737 | 98.3 | 193,917 | 11,621,654 |
| Iowa | 43 | 10.6 | 3.3 | 712,324 | 88.6 | 91,297 | 803,621 |
| Kansas | 30 | 30.9 | 2.3 | 1,263,409 | 100.0 | ---- | 1,263,409 |
| Kentucky | 353 | 28.0 | 3.3 | 25,181,436 | 89.0 | 3,123,432 | 28,304,868 |
| Maryland | 26 | 17.1 | 4.8 | 454,295 | 60.5 | 296,016 | 750,311 |
| Missouri | 64 | 36.1 | 3.6 | 3,189,245 | 99.0 | 31,498 | 3,220,743 |
| Montana: | | | | | | | |
| Bituminous | 1 | 10.0 | .2 | 1,365 | 100.0 | ---- | 1,365 |
| Lignite | 4 | 20.0 | 1.5 | 294,082 | 100.0 | ---- | 294,082 |
| Total Montana | 5 | 18.0 | 1.5 | 295,447 | 100.0 | ---- | 295,447 |
| New Mexico | 23 | 41.6 | 3.7 | 2,551,172 | 100.0 | ---- | 2,551,172 |
| North Dakota (lignite) | 83 | 16.9 | 3.2 | 2,594,155 | 98.5 | 40,729 | 2,634,884 |
| Ohio | 780 | 19.1 | 6.4 | 20,416,864 | 82.3 | 4,398,438 | 24,815,302 |
| Oklahoma | 46 | 19.6 | 10.7 | 1,002,479 | 98.5 | 14,774 | 1,017,253 |
| Pennsylvania | 1,600 | 13.7 | 5.9 | 18,268,070 | 77.7 | 5,237,387 | 23,505,457 |
| South Dakota (lignite) | 4 | 6.0 | 1.0 | 13,000 | 100.0 | ---- | 13,000 |
| Tennessee | 80 | 15.7 | 14.0 | 675,979 | 32.6 | 1,396,015 | 2,071,994 |
| Virginia | 76 | 14.1 | 3.9 | 1,671,399 | 68.2 | 779,356 | 2,450,755 |
| Washington | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| West Virginia | 558 | 15.5 | 6.8 | 5,961,137 | 75.8 | 1,906,735 | 7,867,872 |
| Wyoming | 28 | 24.0 | 6.8 | 2,842,152 | 95.5 | 133,665 | 2,975,817 |
| Total | 4,462 | 19.5 | 4.7 | 132,209,971 | 87.1 | 19,649,008 | 151,858,979 |

**TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, 1964, by States and counties**

| State and county | Number of strip mines | Production (net tons) | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|
| Alabama: | | | | | | |
| Bibb | 6 | 201,422 | 81 | 100 | 8,057 | 25.00 |
| Etowah | 2 | 126,560 | 32 | 307 | 9,872 | 12.82 |
| Jackson | 1 | 135,923 | 68 | 100 | 6,796 | 20.00 |
| Jefferson | 9 | 372,416 | 109 | 243 | 26,394 | 14.11 |
| Marion | 1 | 57,818 | 39 | 100 | 3,855 | 15.00 |
| St. Clair | 1 | 4,000 | 5 | 53 | 267 | 14.98 |
| Tuscaloosa | 9 | 1,055,331 | 113 | 259 | 29,380 | 35.92 |
| Walker | 20 | 1,771,044 | 348 | 158 | 54,967 | 32.22 |
| Winston | 2 | 153,500 | 31 | 248 | 7,675 | 20.00 |
| Total Alabama | 51 | 3,878,014 | 826 | 178 | 147,263 | 26.33 |
| Alaska | 5 | 744,942 | 177 | 267 | 47,208 | 15.78 |
| Arkansas: | | | | | | |
| Franklin | 1 | 86,880 | 15 | 181 | 2,709 | 32.07 |
| Johnson | W | W | W | W | W | W |
| Sebastian | W | W | W | W | W | W |
| Other counties | 5 | 51,551 | 34 | 127 | 4,314 | 11.95 |
| Total Arkansas | 6 | 138,431 | 49 | 143 | 7,023 | 19.71 |

See footnotes at end of table.

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**TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, 1964, by States and counties—Continued**

| State and county | Number of strip mines | Production (net tons) | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|
| Colorado: | | | | | | |
| El Paso | W | W | W | W | W | W |
| Fremont | 5 | 35,010 | 12 | 120 | 1,400 | 25.00 |
| Montrose | W | W | W | W | W | W |
| Routt | W | W | W | W | W | W |
| Other counties | 4 | 910,897 | 102 | 221 | 22,524 | 40.44 |
| Total Colorado | 9 | 945,907 | 114 | 210 | 23,924 | 39.54 |
| Illinois: | | | | | | |
| Adams | 1 | 28,109 | 13 | 150 | 2,008 | 14.00 |
| Bureau | W | W | W | W | W | W |
| Fulton | 8 | 7,433,793 | 738 | 285 | 210,232 | 35.36 |
| Gallatin | 1 | 5,115 | 5 | 100 | 512 | 10.00 |
| Greene | 1 | 3,102 | 6 | 50 | 310 | 10.00 |
| Grundy | W | W | W | W | W | W |
| Jackson | W | W | W | W | W | W |
| Jefferson | 1 | 1,159 | 2 | 55 | 110 | 10.54 |
| Knox | W | W | W | W | W | W |
| Mercer | W | W | W | W | W | W |
| Peoria | 4 | 1,103,718 | 113 | 292 | 33,026 | 33.42 |
| Perry | 3 | 4,051,589 | 354 | 268 | 94,885 | 42.70 |
| Randolph | 2 | 1,541,186 | 126 | 319 | 40,208 | 38.33 |
| St. Clair | W | W | W | W | W | W |
| Saline | 10 | 2,535,837 | 419 | 251 | 105,265 | 24.09 |
| Schuyler | W | W | W | W | W | W |
| Stark | W | W | W | W | W | W |
| Vermilion | W | W | W | W | W | W |
| Wabash | 1 | 1,103 | 2 | 80 | 160 | 6.89 |
| Will | W | W | W | W | W | W |
| Williamson | 10 | 2,712,217 | 312 | 274 | 85,397 | 31.76 |
| Other counties | 15 | 10,571,198 | 986 | 276 | 271,815 | 38.89 |
| Total Illinois | 57 | 29,988,126 | 3,076 | 274 | 843,928 | 35.53 |
| Indiana: | | | | | | |
| Clay | 7 | 960,267 | 143 | 263 | 37,554 | 25.57 |
| Daviess | 1 | 11,100 | 11 | 91 | 1,004 | 11.06 |
| Fountain | W | W | W | W | W | W |
| Greene | 5 | 1,551,511 | 219 | 275 | 60,300 | 25.73 |
| Owen | W | W | W | W | W | W |
| Parke | 1 | 7,416 | 12 | 239 | 2,863 | 2.59 |
| Pike | W | W | W | W | W | W |
| Spencer | 5 | 67,687 | 42 | 135 | 5,617 | 12.05 |
| Sullivan | 1 | 6,740 | 6 | 146 | 925 | 7.29 |
| Vigo | W | W | W | W | W | W |
| Warrick | 9 | 5,934,640 | 379 | 279 | 105,617 | 56.19 |
| Other counties | 8 | 3,082,293 | 433 | 249 | 107,896 | 28.57 |
| Total Indiana | 37 | 11,621,654 | 1,245 | 258 | 321,776 | 36.12 |
| Iowa: | | | | | | |
| Appanoose | 2 | 9,524 | 14 | 31 | 433 | 21.98 |
| Mahaska | 5 | 318,486 | 94 | 295 | 27,840 | 11.44 |
| Marion | 7 | 375,570 | 51 | 289 | 14,728 | 25.50 |
| Monroe | 4 | 26,820 | 4 | 186 | 770 | 34.85 |
| Van Buren | 1 | 16,931 | 8 | 145 | 1,160 | 14.59 |
| Wapello | 2 | 56,290 | 16 | 320 | 5,276 | 10.67 |
| Total Iowa | 21 | 803,621 | 187 | 268 | 50,207 | 16.01 |
| Kansas: | | | | | | |
| Bourbon | 1 | 6,258 | 6 | 104 | 626 | 10.00 |
| Cherokee | W | W | W | W | W | W |
| Crawford | W | W | W | W | W | W |
| Other counties | 6 | 1,257,151 | 242 | 251 | 60,798 | 20.68 |
| Total Kansas | 7 | 1,263,409 | 248 | 248 | 61,424 | 20.57 |

**See footnotes at end of table.**



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**TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, 1964, by States and counties—Continued**

| State and county | Number of strip mines | Production (net tons) | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|
| Kentucky, Eastern: | | | | | | |
| Bell | 18 | 760,614 | 123 | 247 | 30,291 | 25.11 |
| Boyd | 1 | 27,733 | 18 | 100 | 1,849 | 15.00 |
| Breathitt | 2 | 125,115 | 42 | 200 | 8,341 | 15.00 |
| Carter | 1 | 4,000 | 13 | 50 | 667 | 6.00 |
| Clay | 1 | 22,500 | 13 | 150 | 1,875 | 12.00 |
| Harlan | 11 | 355,873 | 34 | 275 | 9,365 | 38.00 |
| Jackson | 2 | 11,096 | 15 | 50 | 740 | 15.00 |
| Knott | 1 | 152,000 | 94 | 65 | 6,080 | 25.00 |
| Knox | 2 | 8,000 | 11 | 50 | 533 | 15.00 |
| Laurel | 3 | 108,729 | 41 | 175 | 7,249 | 15.00 |
| Lawrence | 1 | 2,100 | 7 | 20 | 140 | 15.00 |
| Leslie | 3 | 146,257 | 16 | 150 | 2,438 | 60.00 |
| Letcher | 3 | 150,296 | 60 | 100 | 6,012 | 25.00 |
| Morgan | 2 | 29,508 | 13 | 140 | 1,844 | 16.00 |
| Perry | 3 | 764,797 | 31 | 250 | 7,648 | 100.00 |
| Pike | 6 | 295,111 | 18 | 250 | 4,540 | 65.00 |
| Pulaski | 1 | 72,142 | 6 | 280 | 1,603 | 45.00 |
| Wayne | 1 | 50,000 | 44 | 75 | 3,333 | 15.00 |
| Whitley | 3 | 43,806 | 39 | 75 | 2,920 | 15.00 |
| Total Eastern Kentucky | 65 | 3,129,677 | 638 | 153 | 97,468 | 32.11 |
| Kentucky, Western: | | | | | | |
| Butler | 2 | 140,689 | 78 | 40 | 3,126 | 45.00 |
| Christian | 1 | 13,573 | 9 | 101 | 905 | 15.00 |
| Daviess | 3 | 838,101 | 78 | 293 | 22,799 | 36.76 |
| Hancock | 1 | 1,000 | 5 | 20 | 100 | 10.00 |
| Hopkins | 16 | 3,741,320 | 380 | 263 | 99,902 | 37.45 |
| McLean | 1 | 18,498 | 9 | 103 | 925 | 20.00 |
| Muhlenberg | 11 | 15,806,855 | 812 | 311 | 252,425 | 62.62 |
| Ohio | 8 | 4,113,967 | 233 | 318 | 74,045 | 55.56 |
| Union | 1 | 444,397 | 44 | 200 | 8,888 | 50.00 |
| Webster | 4 | 56,791 | 8 | 250 | 1,895 | 29.97 |
| Total Western Kentucky | 48 | 25,175,191 | 1,656 | 281 | 465,010 | 54.14 |
| Total Kentucky | 113 | 28,304,868 | 2,294 | 245 | 562,478 | 50.32 |
| Maryland: | | | | | | |
| Allegany | 17 | 140,733 | 54 | 214 | 11,583 | 12.15 |
| Garrett | 15 | 609,578 | 61 | 272 | 16,637 | 36.64 |
| Total Maryland | 32 | 750,311 | 115 | 245 | 28,220 | 26.59 |
| Missouri: | | | | | | |
| Boone | W | W | W | W | W | W |
| Callaway | 1 | 27,957 | 7 | 260 | 1,820 | 15.36 |
| Clark | W | W | W | W | W | W |
| Dade | 1 | 17,000 | 8 | 285 | 2,279 | 7.46 |
| Henry | W | W | W | W | W | W |
| Macon | W | W | W | W | W | W |
| Putnam | 2 | 131,482 | 29 | 300 | 8,763 | 15.00 |
| St. Clair | 2 | 191,090 | 66 | 139 | 9,165 | 20.85 |
| Vernon | 2 | 52,964 | 35 | 151 | 5,296 | 10.00 |
| Other counties | 8 | 2,800,250 | 272 | 273 | 74,376 | 37.65 |
| Total Missouri | 16 | 3,220,743 | 417 | 244 | 101,701 | 31.67 |
| Montana (bituminous): Big Horn | (1) | (1) | (1) | (1) | (1) | (1) |
| Montana (lignite): Richland | (1) | (1) | (1) | (1) | (1) | (1) |
| Total Montana | (1) | (1) | (1) | (1) | (1) | (1) |
| New Mexico: | | | | | | |
| McKinley | (1) | (1) | (1) | (1) | (1) | (1) |
| San Juan | (1) | (1) | (1) | (1) | (1) | (1) |
| Total New Mexico [1] | 5 | 2,846,619 | 146 | 260 | 37,902 | 75.10 |

**See footnotes at end of table.**

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**TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, 1964, by States and counties—Continued**

| State and county | Number of strip mines | Production (net tons) | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|
| North Dakota (lignite): | | | | | | |
| Adams | 1 | 15,637 | 4 | 250 | 1,117 | 14.00 |
| Bowman | 1 | 139,867 | 10 | 213 | 2,109 | 66.32 |
| Burke | W | W | W | W | W | W |
| Burleigh | 1 | 7,988 | 4 | 100 | 399 | 20.00 |
| Dunn | 1 | 2,809 | 3 | 100 | 312 | 9.00 |
| Grant | 4 | 19,930 | 7 | 135 | 997 | 20.00 |
| Hettinger | 1 | 2,919 | 1 | 150 | 146 | 20.00 |
| McLean | 3 | 47,842 | 16 | 64 | 1,016 | 47.09 |
| Mercer | W | W | W | W | W | W |
| Morton | W | W | W | W | W | W |
| Oliver | W | W | W | W | W | W |
| Stark | 3 | 88,848 | 15 | 150 | 2,221 | 40.00 |
| Ward | W | W | W | W | W | W |
| Other counties | 13 | 2,309,044 | 215 | 219 | 47,109 | 49.01 |
| Total North Dakota (lignite) | 28 | 2,634,884 | 275 | 202 | 55,426 | 47.54 |
| Ohio: | | | | | | |
| Athens | 2 | 16,876 | 15 | 125 | 1,875 | 9.00 |
| Belmont | 20 | 3,303,635 | 852 | 256 | 218,206 | 15.14 |
| Carroll | 9 | 258,841 | 50 | 296 | 14,927 | 17.34 |
| Columbiana | 37 | 1,342,526 | 263 | 293 | 77,157 | 17.40 |
| Coshocton | 8 | 1,817,441 | 176 | 307 | 54,123 | 33.58 |
| Gallia | 7 | 423,377 | 92 | 364 | 33,495 | 12.64 |
| Guernsey | 6 | 233,594 | 58 | 200 | 11,680 | 20.00 |
| Harrison | 11 | 3,415,780 | 310 | 220 | 68,247 | 50.05 |
| Hocking | 5 | 64,768 | 32 | 186 | 5,986 | 10.82 |
| Holmes | 3 | 202,723 | 33 | 312 | 10,450 | 19.40 |
| Jackson | 12 | 515,290 | 621 | 211 | 131,117 | 3.93 |
| Jefferson | 31 | 3,275,578 | 428 | 266 | 113,933 | 28.75 |
| Lawrence | W | W | W | W | W | W |
| Mahoning | 14 | 789,408 | 161 | 329 | 52,839 | 14.94 |
| Meigs | 4 | 278,541 | 70 | 200 | 13,927 | 20.00 |
| Morgan | 4 | 1,869,058 | 143 | 359 | 51,320 | 36.42 |
| Muskingum | 4 | 42,403 | 28 | 150 | 4,240 | 10.00 |
| Noble | 11 | 2,375,505 | 168 | 330 | 55,296 | 42.96 |
| Perry | W | W | W | W | W | W |
| Portage | 1 | 62,628 | 17 | 310 | 5,362 | 11.68 |
| Stark | 12 | 398,541 | 83 | 295 | 24,616 | 16.19 |
| Tuscarawas | 36 | 2,138,422 | 512 | 304 | 155,522 | 13.75 |
| Vinton | 3 | 133,781 | 37 | 291 | 10,780 | 12.41 |
| Wayne | 3 | 52,062 | 59 | 126 | 7,437 | 7.00 |
| Other counties | 12 | 1,804,524 | 173 | 305 | 52,710 | 34.23 |
| Total Ohio | 255 | 24,815,302 | 4,381 | 268 | 1,175,245 | 21.12 |
| Oklahoma: | | | | | | |
| Craig | 7 | 323,092 | 81 | 279 | 22,641 | 14.27 |
| Haskell | W | W | W | W | W | W |
| Muskogee | 1 | 1,350 | 3 | 113 | 338 | 4.00 |
| Okmulgee | 1 | 1,700 | 2 | 53 | 106 | 16.04 |
| Rogers | W | W | W | W | W | W |
| Other counties | 3 | 691,111 | 132 | 221 | 29,128 | 23.73 |
| Total Oklahoma | 12 | 1,017,253 | 218 | 240 | 52,213 | 19.48 |
| Pennsylvania: | | | | | | |
| Allegheny | 17 | 865,293 | 116 | 230 | 26,665 | 32.45 |
| Armstrong | 47 | 1,489,743 | 428 | 161 | 68,842 | 21.64 |
| Beaver | 12 | 430,927 | 86 | 293 | 25,215 | 17.09 |
| Bedford | W | W | W | W | W | W |
| Blair | 1 | 4,761 | 3 | 176 | 598 | 7.96 |
| Bradford | W | W | W | W | W | W |
| Butler | 33 | 1,495,691 | 301 | 232 | 69,859 | 21.41 |
| Cambria | 20 | 1,088,975 | 253 | 206 | 52,154 | 20.88 |
| Cameron | W | W | W | W | W | W |
| Centre | 13 | 546,840 | 138 | 263 | 36,287 | 15.07 |
| Clarion | 27 | 3,045,757 | 646 | 273 | 176,463 | 17.26 |
| Clearfield | 92 | 6,087,685 | 1,357 | 235 | 318,894 | 19.09 |
| Clinton | 7 | 479,783 | 67 | 281 | 18,712 | 25.64 |
| Elk | 8 | 298,869 | 71 | 227 | 16,120 | 18.54 |
| Fayette | 26 | 536,176 | 125 | 224 | 27,897 | 19.22 |
| Greene | 9 | 100,344 | 27 | 130 | 3,548 | 28.28 |
| Huntingdon | W | W | W | W | W | W |

**See footnotes at end of table.**

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**TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, 1964, by States and counties—Continued**

| State and county | Number of strip mines | Production (net tons) | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|
| Pennsylvania—Continued | | | | | | |
| Indiana | 26 | 733,233 | 198 | 189 | 37,372 | 19.62 |
| Jefferson | 25 | 1,097,055 | 283 | 221 | 62,653 | 17.51 |
| Lawrence | 19 | 824,743 | 150 | 270 | 40,409 | 20.41 |
| Lycoming | W | W | W | W | W | W |
| McKean | 1 | 21,700 | 22 | 100 | 2,170 | 10.00 |
| Mercer | 11 | 586,780 | 117 | 313 | 36,651 | 16.01 |
| Somerset | 49 | 1,816,917 | 291 | 200 | 58,141 | 31.25 |
| Tioga | 5 | 350,132 | 84 | 225 | 18,906 | 18.52 |
| Venango | 14 | 456,621 | 69 | 236 | 16,198 | 28.19 |
| Washington | 13 | 686,698 | 152 | 217 | 32,935 | 20.85 |
| Westmoreland | 25 | 189,718 | 60 | 196 | 11,689 | 16.23 |
| Other counties | 10 | 271,016 | 88 | 261 | 22,932 | 11.82 |
| Total Pennsylvania | 510 | 23,505,457 | 5,132 | 230 | 1,181,310 | 19.90 |
| South Dakota (lignite): Dewey | 1 | 13,000 | 8 | 163 | 1,300 | 10.00 |
| Tennessee: | | | | | | |
| Anderson | 9 | 465,103 | 72 | 206 | 14,855 | 31.31 |
| Campbell | 11 | 527,387 | 85 | 166 | 14,049 | 37.54 |
| Claiborne | 4 | 103,263 | 15 | 233 | 3,526 | 29.29 |
| Grundy | W | W | W | W | W | W |
| Hamilton | W | W | W | W | W | W |
| Marion | 1 | 15,056 | 13 | 75 | 1,003 | 15.00 |
| Morgan | 6 | 125,720 | 16 | 178 | 2,868 | 43.83 |
| Scott | 6 | 228,071 | 84 | 90 | 7,602 | 30.00 |
| Van Buren | 5 | 266,552 | 37 | 233 | 8,646 | 30.83 |
| Other counties | 5 | 340,842 | 68 | 284 | 19,331 | 17.63 |
| Total Tennessee | 47 | 2,071,994 | 390 | 184 | 71,880 | 28.83 |
| Virginia: | | | | | | |
| Buchanan | 9 | 610,674 | 122 | 200 | 24,427 | 25.00 |
| Dickenson | 11 | 530,753 | 53 | 200 | 10,615 | 50.00 |
| Lee | 1 | 1,024 | 1 | 75 | 68 | 15.00 |
| Russell | 1 | 2,945 | 3 | 75 | 196 | 15.00 |
| Tazewell | 2 | 34,334 | 17 | 100 | 1,717 | 20.00 |
| Wise | 20 | 1,271,025 | 139 | 240 | 33,448 | 38.00 |
| Total Virginia | 44 | 2,450,755 | 335 | 210 | 70,471 | 34.78 |
| West Virginia: | | | | | | |
| Barbour | 14 | 679,102 | 125 | 166 | 20,812 | 32.63 |
| Boone | 5 | 506,027 | 105 | 214 | 22,500 | 22.49 |
| Brooke | 6 | 395,580 | 57 | 302 | 17,192 | 23.01 |
| Fayette | 8 | 418,399 | 48 | 254 | 12,291 | 34.04 |
| Gilmer | 1 | 5,252 | 11 | 50 | 525 | 10.00 |
| Grant | W | W | W | W | W | W |
| Greenbrier | 1 | 9,660 | 6 | 100 | 644 | 15.00 |
| Hancock | 1 | 34,620 | 15 | 150 | 2,308 | 15.00 |
| Harrison | 30 | 1,415,755 | 286 | 225 | 64,353 | 22.00 |
| Kanawha | 7 | 259,509 | 29 | 197 | 5,748 | 45.15 |
| Lewis | 6 | 118,707 | 59 | 100 | 5,935 | 20.00 |
| Lincoln | 4 | 18,363 | 15 | 102 | 1,530 | 12.00 |
| Logan | W | W | W | W | W | W |
| Marion | W | W | W | W | W | W |
| Mason | 3 | 135,165 | 25 | 196 | 4,988 | 27.10 |
| McDowell | 10 | 785,719 | 77 | 277 | 21,368 | 36.77 |
| Mercer | 6 | 223,771 | 37 | 175 | 6,393 | 35.00 |
| Mineral | 1 | 26,085 | 3 | 198 | 594 | 43.91 |
| Mingo | 1 | 28,433 | 18 | 40 | 710 | 40.00 |
| Monongalia | 7 | 125,955 | 19 | 225 | 4,199 | 30.00 |
| Nicholas | 8 | 254,467 | 43 | 202 | 8,733 | 29.14 |
| Preston | 29 | 1,067,505 | 169 | 294 | 49,721 | 21.47 |
| Raleigh | 7 | 293,797 | 27 | 243 | 6,493 | 45.26 |
| Randolph | 7 | 121,360 | 19 | 193 | 3,751 | 32.35 |
| Taylor | 5 | 228,399 | 35 | 75 | 2,656 | 86.00 |
| Tucker | 5 | 195,431 | 24 | 200 | 4,886 | 40.00 |
| Upshur | 2 | 43,856 | 9 | 75 | 692 | 63.40 |
| Webster | 2 | 61,416 | 37 | 224 | 8,178 | 7.51 |
| Wyoming | 6 | 276,226 | 39 | 200 | 7,892 | 35.00 |
| Other counties | 6 | 139,313 | 42 | 141 | 5,941 | 23.45 |
| Total West Virginia | 188 | 7,867,872 | 1,379 | 211 | 291,033 | 27.03 |

**See footnotes at end of table.**

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**TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, 1964, by States and counties—Continued**

| State and county | Number of strip mines | Production (net tons) | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|
| Wyoming: | | | | | | |
| Campbell | 1 | 488,846 | 34 | 261 | 8,888 | 55.00 |
| Carbon | 4 | 446,509 | 77 | 145 | 11,163 | 40.00 |
| Converse | W | W | W | W | W | W |
| Lincoln | W | W | W | W | W | W |
| Sheridan | 2 | 431,521 | 38 | 252 | 9,589 | 45.00 |
| Other counties | 4 | 1,608,941 | 105 | 212 | 22,297 | 72.16 |
| Total Wyoming | 11 | 2,975,817 | 254 | 204 | 51,937 | 57.30 |
| Total United States | 1,455 | 151,858,979 | 21,266 | 244 | 5,183,869 | 29.29 |

W Withheld to avoid disclosing individual company data; included with "other counties."
[1] To avoid disclosing individual operations Montana and New Mexico are combined.

## AUGER MINING

Augers are generally used in areas where strip mining has become economically impracticable because the overburden is thick. They were used first about 1945, and separate statistics on coal-recovery augers begin with 1951. The rapidly expanded production of coal by stripping during World War II in the mountainous areas of the northern Appalachian region left many miles of high wall containing exposed coal seams. After several years of experimentation, large, efficient augers as much as 84 inches in diameter were developed to recover the coal from these exposed coal seams.

Production at auger mines increased rapidly from 205,000 tons in 1951 to 13 millions tons in 1964. Augers were used to mine coal in seven States in 1964, and sales of augers reported by three manufacturers indicate continued growth of auger mining. A few coal-recovery augers have been sold for underground use; these units and the coal produced by them have been included with coal loaded mechanically underground.

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TABLE 36.—Auger mines in the bituminous coal and lignite fields of the United States, 1964, by States and counties

| State and county | Number of auger mines | Equipment in use (number of units) | | | | Production (net tons) | Average number of men working daily | Average Number of days worked | Number of man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Augers | Power shovels | Power drills | Bull-dozers | | | | | |
| **Alabama:** | | | | | | | | | | |
| Jefferson | 1 | 1 | | | 1 | 12,348 | 4 | 150 | 617 | 20.00 |
| Walker | 3 | 4 | | | 1 | 83,140 | 36 | 171 | 6,195 | 31.42 |
| Total Alabama | 4 | 5 | | | 2 | 95,488 | 40 | 170 | 6,812 | 14.02 |
| **Kentucky, Eastern:** | | | | | | | | | | |
| Bell | 11 | 10 | | | 2 | 522,672 | 25 | 280 | 6,969 | 75.00 |
| Breathitt | 1 | 1 | | | 1 | 26,362 | 7 | 150 | 1,054 | 25.00 |
| Clay | 1 | 1 | | | | 71,784 | 14 | 175 | 2,393 | 30.00 |
| Floyd | 4 | 4 | | | | 70,474 | 23 | 100 | 2,349 | 30.00 |
| Harlan | 14 | 14 | | 3 | 13 | 440,444 | 29 | 275 | 8,008 | 55.00 |
| Jackson | 1 | 1 | | | 1 | 25,100 | 6 | 200 | 1,255 | 20.00 |
| Johnson | 2 | 2 | | | | 43,969 | 18 | 100 | 1,759 | 25.00 |
| Knott | 7 | 7 | | | 3 | 230,159 | 480 | 30 | 14,385 | 16.00 |
| Knox | 5 | 5 | | | | 46,500 | 4 | 150 | 581 | 80.00 |
| Leslie | 2 | 2 | | | 1 | 48,343 | 24 | 50 | 1,209 | 40.00 |
| Letcher | 18 | 18 | | 2 | 8 | 594,547 | 125 | 129 | 16,139 | 36.84 |
| Martin | 2 | 2 | | | | 4,000 | 8 | 25 | 200 | 20.00 |
| Perry | 18 | 19 | 1 | | 16 | 1,020,045 | 147 | 167 | 24,568 | 41.52 |
| Pike | 37 | 38 | 2 | | 9 | 1,356,625 | 125 | 145 | 18,088 | 75.00 |
| Pulaski | 1 | 1 | | | | 31,920 | 5 | 230 | 1,140 | 28.00 |
| Whitley | 2 | 2 | | | 2 | 46,122 | 6 | 220 | 1,349 | 34.18 |
| Total Eastern Kentucky | 126 | 127 | 3 | 5 | 56 | 4,579,066 | 1,046 | 97 | 101,446 | 45.14 |
| **Kentucky, Western:** | | | | | | | | | | |
| Hopkins | 2 | 2 | 2 | | 3 | 59,672 | 13 | 80 | 1,036 | 57.60 |
| Ohio | 1 | 1 | | | | 20,719 | 4 | 80 | 320 | 64.72 |
| Total Western Kentucky | 3 | 3 | 2 | | 3 | 80,391 | 17 | 80 | 1,356 | 59.29 |
| Total Kentucky | 129 | 130 | 5 | 5 | 59 | 4,659,457 | 1,063 | 97 | 102,802 | 45.32 |
| **Ohio:** | | | | | | | | | | |
| Athens | 1 | 1 | | | 1 | 3,306 | 3 | 75 | 194 | 17.00 |
| Belmont | 6 | 7 | 1 | 1 | 7 | 74,510 | 30 | 147 | 4,430 | 16.82 |
| Carroll | W | W | W | W | W | W | W | W | W | W |
| Columbiana | 10 | 9 | | | 6 | 166,176 | 11 | 214 | 2,316 | 71.74 |
| Coshocton | W | W | W | W | W | W | W | W | W | W |
| Gallia | 3 | 3 | 1 | | 3 | 104,708 | 7 | 259 | 1,740 | 60.17 |
| Guernsey | 3 | 2 | | | 1 | 72,605 | 25 | 150 | 764 | 95.00 |
| Harrison | 5 | 5 | 1 | | 7 | 87,399 | 11 | 100 | 1,092 | 80.00 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Hocking | W | W | W | W | W | W | W | W | W | W |
| Jefferson | 9 | 9 | | | 8 | 299,666 | 15 | 217 | 3,253 | 92.11 |
| Meigs | 2 | 2 | | | 1 | 99,159 | 21 | 120 | 2,479 | 40.00 |
| Muskingum | W | W | W | W | W | W | W | W | W | W |
| Noble | 4 | 6 | 1 | | 6 | 346,929 | 64 | 135 | 8,673 | 40.00 |
| Perry | W | W | W | W | W | W | W | W | W | W |
| Stark | 1 | 1 | | | | 8,425 | 7 | 90 | 602 | 14.00 |
| Tuscarawas | 3 | 3 | | | 3 | 42,391 | 14 | 75 | 1,060 | 40.00 |
| Other counties | 7 | 7 | 1 | | 9 | 444,939 | 43 | 205 | 8,817 | 50.46 |
| Total Ohio | 54 | 55 | 5 | 1 | 49 | 1,750,213 | 231 | 153 | 35,420 | 49.41 |
| Pennsylvania: | | | | | | | | | | |
| Allegheny | W | W | W | W | W | W | W | W | W | W |
| Armstrong | 7 | 5 | | | | 88,431 | 22 | 90 | 1,957 | 45.18 |
| Beaver | W | W | W | W | W | W | W | W | W | W |
| Butler | 14 | 17 | | | 1 | 153,579 | 17 | 185 | 3,092 | 49.67 |
| Cambria | 6 | 4 | | | | 31,971 | 8 | 92 | 743 | 43.02 |
| Centre | 1 | 1 | | | | 9,844 | 3 | 40 | 126 | 78.33 |
| Clarion | 4 | 5 | | | 1 | 45,354 | 14 | 156 | 2,159 | 21.01 |
| Clearfield | 17 | 18 | 1 | 4 | 2 | 390,424 | 112 | 154 | 17,283 | 22.59 |
| Elk | 3 | 4 | | 1 | 1 | 11,044 | 2 | 183 | 450 | 24.54 |
| Indiana | 2 | 2 | | | 1 | 10,007 | 5 | 46 | 230 | 43.55 |
| Jefferson | 8 | 9 | | 1 | | 101,099 | 53 | 104 | 5,474 | 18.47 |
| Lawrence | 2 | 2 | | | 1 | 9,693 | 4 | 100 | 388 | 25.00 |
| Venango | W | W | W | W | W | W | W | W | W | W |
| Washington | W | W | W | W | W | W | W | W | W | W |
| Westmoreland | 1 | 1 | | | | 4,450 | 4 | 60 | 223 | 20.00 |
| Other counties | 11 | 11 | | 3 | 4 | 193,255 | 32 | 165 | 5,273 | 36.65 |
| Total Pennsylvania | 76 | 79 | 1 | 9 | 11 | 1,049,151 | 276 | 136 | 37,398 | 28.05 |
| Tennessee: | | | | | | | | | | |
| Anderson | 1 | 1 | | | 2 | 12,453 | 5 | 68 | 360 | 34.63 |
| Campbell | 1 | 1 | | | 1 | 36,000 | 14 | 100 | 1,440 | 25.00 |
| Claiborne | 2 | 2 | 1 | | 1 | 101,795 | 15 | 200 | 2,908 | 35.00 |
| Morgan | 1 | 1 | | | | 50,919 | 17 | 100 | 1,697 | 30.00 |
| Scott | 2 | 2 | 2 | 2 | | 53,097 | 5 | 250 | 1,327 | 40.00 |
| Total Tennessee | 7 | 7 | 3 | 2 | 4 | 254,264 | 56 | 138 | 7,732 | 32.88 |
| Virginia: | | | | | | | | | | |
| Buchanan | 24 | 24 | | | 26 | 511,008 | 51 | 200 | 10,220 | 50.00 |
| Dickenson | 11 | 11 | | | 10 | 160,421 | 40 | 100 | 4,011 | 40.00 |
| Lee | W | W | W | W | W | W | W | W | W | W |
| Russell | W | W | W | W | W | W | W | W | W | W |
| Tazewell | 2 | 2 | | | 2 | 6,086 | 3 | 50 | 152 | 40.00 |
| Wise | 16 | 17 | | | 12 | 410,761 | 34 | 169 | 5,726 | 71.73 |
| Other counties | 3 | 3 | | | 5 | 49,651 | 21 | 114 | 2,398 | 20.71 |
| Total Virginia | 56 | 57 | | | 55 | 1,137,927 | 149 | 151 | 22,507 | 50.56 |

**See footnote at end of table.**

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**TABLE 36.—Auger mines in the bituminous coal and lignite fields of the United States, 1964, by States and counties—Continued**

| State and county | Number of auger mines | Equipment in use (number of units) | | | | Production (net tons) | Average number of men working daily | Average number of days worked | Number man-days worked | Average tons per man per day |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Augers | Power shovels | Power drills | Bulldozers | | | | | |
| West Virginia: | | | | | | | | | | |
| Barbour | W | W | W | W | W | W | W | W | W | W |
| Boone | 10 | 12 | 4 | 1 | 16 | 1,257,349 | 114 | 203 | 23,130 | 54.36 |
| Brooke | 4 | 4 | | | 3 | 56,720 | 6 | 126 | 748 | 75.83 |
| Clay | 1 | 1 | 1 | | 1 | 9,955 | 10 | 50 | 498 | 20.00 |
| Fayette | 4 | 5 | 1 | 1 | 5 | 272,906 | 37 | 204 | 7,497 | 36.40 |
| Harrison | 12 | 12 | | | 10 | 277,748 | 30 | 100 | 2,991 | 92.86 |
| Kanawha | 15 | 15 | 5 | 3 | 19 | 1,053,367 | 193 | 179 | 34,469 | 30.56 |
| Lewis | 2 | 1 | | | | 38,676 | 13 | 100 | 1,289 | 30.00 |
| Logan | 6 | 7 | | | 7 | 401,947 | 33 | 144 | 4,751 | 84.60 |
| Mason | 1 | 1 | | | | 5,795 | 2 | 130 | 232 | 25.00 |
| McDowell | 10 | 12 | | | 5 | 311,098 | 34 | 213 | 7,281 | 42.73 |
| Mercer | 6 | 6 | | | 1 | 35,456 | 16 | 75 | 1,182 | 30.00 |
| Mingo | 7 | 7 | | | 5 | 184,125 | 21 | 196 | 4,076 | 45.17 |
| Monongalia | W | W | W | W | W | W | W | W | W | W |
| Nicholas | 5 | 6 | | | 4 | 92,947 | 30 | 90 | 2,737 | 33.96 |
| Preston | W | W | W | W | W | W | W | W | W | W |
| Raleigh | 7 | 9 | 5 | 3 | 10 | 202,299 | 25 | 89 | 2,257 | 89.62 |
| Randolph | W | W | W | W | W | W | W | W | W | W |
| Webster | 1 | 1 | | | | 1,200 | 4 | 20 | 80 | 15.00 |
| Wyoming | 6 | 7 | 1 | | 3 | 60,994 | 13 | 190 | 2,440 | 25.00 |
| Other counties | 6 | 6 | 1 | | 3 | 121,977 | 68 | 65 | 4,418 | 27.61 |
| Total West Virginia | 103 | 112 | 18 | 8 | 92 | 4,384,559 | 649 | 154 | 100,076 | 43.81 |
| Total United States | 429 | 445 | 32 | 25 | 272 | 13,331,059 | 2,464 | 127 | 312,747 | 42.63 |

W Withheld to avoid disclosing individual company data; included with "Other counties."

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TABLE 37.—Units of coal-recovery augers sold to bituminous coal and lignite mines for surface use in the United States, as reported by manufacturers, by States

| | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Alabama | | 1 | 1 | | 2 |
| Iowa | | | 1 | | |
| Kentucky | 8 | 5 | 4 | 16 | 6 |
| Ohio | 5 | 5 | 2 | 4 | 3 |
| Pennsylvania | 7 | 4 | 4 | 6 | 4 |
| Tennessee | 1 | 1 | | | 1 |
| Virginia | 1 | | 1 | 1 | 3 |
| West Virginia | 3 | 2 | 2 | 9 | 7 |
| Total | 25 | 18 | 15 | 36 | 26 |

## MECHANICAL LOADING

Prior to 1925 less than 1 percent of the total underground output was mechanically loaded. During the following 10 years (1925–35), as better machines were developed, mechanical loading increased more than 1 percent per year, and in 1935 almost 14 percent of the total underground output was mechanically loaded. Development was rapid in some States but practically nonexistent in others. The percentage of underground production mechanically loaded in 1935 in some States was as follows: Wyoming (90), Illinois (56), Indiana (64), Pennsylvania (7), West Virginia (2), and Kentucky (1). During the next 20 years (1935–55), mechanical loading increased rapidly, averaging a gain of more than 3 percent per year, until it included 85 percent of the underground output in 1955.

Although the increase in mechanical loading has leveled off in the past few years, the type of loading equipment has changed considerably. In the past 10 years, the proportion produced by mobile loading into mine cars decreased from 14 to 2 percent of the total underground production, and mobile loading into shuttle cars decreased from 53 percent in 1954 to 44 percent in 1964; production from continuous-mining machines increased from 6 to 39 percent, all other types of mechanical loading decreased from 11 to 2 percent, and hand loading into mine cars decreased from 16 to 13 percent during the same period.

The most important change in mechanical loading in recent years was the introduction of continuous-mining machines. In 1964, 125 million tons of bituminous coal was produced at 361 mines by continuous-mining machines, whereas in 1963, 104 million tons were produced at 342 mines. In 1964, 219 mines, compared with 193 mines in 1963, used continuous-mining machines exclusively.

Longwall mining began in November 1951, on a 340-foot face in the Pocahontas No. 4 seam in Raleigh County, W. Va. Production from longwall mining to date has not been large, and as a result separate figures begin with 1963 when 816,003 tons were mined by this method. In 1964, longwall mining was practiced in three States (Illinois, Utah, and West Virginia), and a total of 1,450,629 tons was mined by this method.

Sales of mobile loading machines, continuous-mining machines, shuttle cars, and gathering and haulage conveyors increased, whereas sales of room or transfer conveyors and bridge conveyors decreased.

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## TABLE 38.—Growth of mechanical loading at underground bituminous coal and lignite mines in the United States

| Year | Underground production (thousand net tons) | | | | | | | Percentage of underground production | | Number of mechanical loading units | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mechanically loaded | | | | | Hand-loaded into mine cars | Total | Mechanically loaded | Hand-loaded into mine cars | Mobile loading machines used in conventional mining | Duckbills and scrapers [1] | Hand-loaded conveyors and pit-car loaders [1] | Continuous mining machines | Mobile loading machine used in conjunction with continuous mining |
| | Conventional mining | | | Continuous mining | Total | | | | | | | | | |
| | Mobile loading machines | Duckbills and scrapers [1] | Hand-loaded conveyors and pit-car loaders [1] | | | | | | | | | | | |
| 1923 | NA | NA | NA | ---------- | [2] 1,880 | 550,745 | 552,625 | 0.3 | 99.7 | NA | NA | NA | ---------- | ---------- |
| 1924 | NA | NA | NA | ---------- | [2] 3,496 | 466,584 | 470,080 | .7 | 99.3 | NA | NA | NA | ---------- | ---------- |
| 1925 | NA | NA | NA | ---------- | [2] 6,243 | 496,939 | 503,182 | 1.2 | 98.8 | NA | NA | NA | ---------- | ---------- |
| 1926 | 7,786 | 2,236 | 523 | ---------- | [2] 10,545 | 545,899 | 556,444 | 1.9 | 98.1 | 295 | 160 | NA | ---------- | ---------- |
| 1927 | NA | NA | NA | ---------- | 16,500 | 482,885 | 499,385 | 3.3 | 96.7 | NA | NA | NA | ---------- | ---------- |
| 1928 | 11,811 | 2,748 | 7,000 | ---------- | 21,559 | 459,397 | 480,956 | 4.5 | 95.5 | 397 | 212 | 1,040 | ---------- | ---------- |
| 1929 | 16,432 | 2,859 | 18,571 | ---------- | 37,862 | 476,859 | 514,721 | 7.4 | 92.6 | 488 | 225 | 2,521 | ---------- | ---------- |
| 1930 | 20,073 | 3,265 | 23,644 | ---------- | 46,982 | 400,702 | 447,684 | 10.5 | 89.5 | 545 | 290 | 2,876 | ---------- | ---------- |
| 1931 | 19,407 | 3,282 | 24,673 | ---------- | 47,562 | 315,595 | 363,157 | 13.1 | 86.9 | 583 | 311 | 3,428 | ---------- | ---------- |
| 1932 | 14,825 | 2,762 | 18,230 | ---------- | 35,817 | 254,252 | 290,069 | 12.3 | 87.7 | 548 | 287 | 3,112 | ---------- | ---------- |
| 1933 | 17,865 | 2,647 | 17,309 | ---------- | 37,821 | 277,539 | 315,360 | 12.0 | 88.0 | 523 | 225 | 2,978 | ---------- | ---------- |
| 1934 | 20,750 | 3,086 | 17,597 | ---------- | 41,433 | 297,145 | 338,578 | 12.2 | 87.8 | 534 | 276 | 2,862 | ---------- | ---------- |
| 1935 | 24,675 | 3,713 | 18,789 | ---------- | 47,177 | 301,549 | 348,726 | 13.5 | 86.5 | 657 | 257 | 2,768 | ---------- | ---------- |
| 1936 | 40,970 | 4,513 | 21,494 | ---------- | 66,977 | 343,985 | 410,962 | 16.3 | 83.7 | 980 | 340 | 2,787 | ---------- | ---------- |
| 1937 | NA | NA | NA | ---------- | 83,500 | 330,280 | 413,780 | 20.2 | 79.8 | NA | NA | NA | ---------- | ---------- |
| 1938 | 57,824 | 5,279 | 21,990 | ---------- | 85,093 | 233,045 | 318,138 | 26.7 | 73.3 | 1,405 | 463 | 2,918 | ---------- | ---------- |
| 1939 | 76,442 | 7,766 | 26,504 | ---------- | 110,712 | 246,421 | 357,133 | 31.0 | 69.0 | 1,573 | 690 | 2,707 | ---------- | ---------- |
| 1940 | 100,962 | 11,617 | 35,291 | ---------- | 147,870 | 269,734 | 417,604 | 35.4 | 64.6 | 1,720 | 772 | 2,960 | ---------- | ---------- |
| 1941 | 126,478 | 16,208 | 43,981 | ---------- | 186,667 | 272,411 | 459,078 | 40.7 | 59.3 | 1,985 | 897 | 3,414 | ---------- | ---------- |
| 1942 | 160,301 | 22,088 | 50,514 | ---------- | 232,903 | 282,587 | 515,490 | 45.2 | 54.8 | 2,301 | 1,155 | 3,522 | ---------- | ---------- |
| 1943 | 179,008 | 24,266 | 46,531 | ---------- | 249,805 | 260,687 | 510,492 | 48.9 | 51.1 | 2,525 | 1,309 | 3,512 | ---------- | ---------- |
| 1944 | 202,875 | 24,505 | 46,809 | ---------- | 274,189 | 244,489 | 518,678 | 52.9 | 47.1 | 2,737 | 1,418 | 3,477 | ---------- | ---------- |
| 1945 | 198,668 | 22,758 | 41,086 | ---------- | 262,512 | 205,118 | 467,630 | 56.1 | 43.9 | 2,950 | 1,470 | 3,527 | ---------- | ---------- |
| 1946 | 186,975 | 20,595 | 37,771 | ---------- | 245,341 | 175,617 | 420,958 | 58.3 | 41.7 | 3,200 | 1,596 | 3,563 | ---------- | ---------- |
| 1947 | 229,836 | 22,775 | 45,546 | ---------- | 298,157 | 193,072 | 491,229 | 60.7 | 39.3 | 3,569 | 1,598 | 4,050 | ---------- | ---------- |
| 1948 | 232,217 | 20,377 | 42,762 | 450 | 295,806 | 164,206 | 460,012 | 64.3 | 35.7 | [3] 3,965 | 1,688 | 4,162 | 15 | NA |
| 1949 | 174,639 | 14,333 | 30,804 | 2,600 | 222,376 | 109,447 | 331,823 | 67.0 | 33.0 | [3] 4,155 | 1,529 | 4,329 | 50 | NA |

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| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1950 | 218,126 | 14,303 | 35,446 | 4,860 | 272,725 | 120,119 | 392,844 | 69.4 | 30.6 | [3] 4,228 | 1,308 | 4,446 | 90 | NA |
| 1951 | 246,397 | 14,010 | 37,883 | 6,061 | 304,051 | 111,791 | 415,842 | 73.1 | 26.9 | [3] 4,302 | 1,294 | 5,904 | 194 | NA |
| 1952 | 218,962 | 10,667 | 31,130 | 8,218 | 268,994 | 87,431 | 356,425 | 75.5 | 24.5 | [3] 4,063 | 1,068 | 5,949 | 152 | NA |
| 1953 | 232,585 | 8,770 | 25,144 | 11,830 | 278,329 | 71,222 | 349,551 | 79.6 | 20.4 | [3] 3,983 | 878 | 2,994 | 219 | NA |
| 1954 | 206,546 | 5,063 | 15,003 | 16,338 | 242,970 | 46,142 | 289,112 | 84.0 | 16.0 | [4] 4,224 | 681 | 2,162 | 325 | 90 |
| 1955 | 243,204 | 4,510 | 15,497 | 27,460 | 290,671 | 52,793 | 343,465 | 84.6 | 15.4 | [4] 3,679 | 510 | 1,925 | 385 | 140 |
| 1956 | 248,341 | 3,883 | 15,271 | 39,907 | 307,402 | 58,372 | 365,774 | 84.0 | 16.0 | [4] 3,606 | 472 | 1,819 | 510 | 188 |
| 1957 | 236,720 | 2,781 | 12,453 | 53,783 | 305,737 | 54,912 | 360,649 | 84.8 | 15.2 | [4] 3,556 | 375 | 1,538 | 614 | 199 |
| 1958 | 178,014 | 1,860 | 7,626 | 56,373 | 243,873 | 43,311 | 286,884 | 84.9 | 15.1 | [4] 3,212 | 249 | 1,230 | 679 | 222 |
| 1959 | 171,150 | 1,010 | 6,779 | 65,792 | 243,731 | 39,703 | 283,434 | 86.0 | 14.0 | [4] 2,895 | 144 | 1,014 | 776 | 226 |
| 1960 | 162,109 | 1,232 | 4,517 | 77,928 | 245,786 | 39,102 | 284,888 | 86.3 | 13.7 | [4] 2,707 | 159 | 931 | 879 | 245 |
| 1961 | 145,134 | 1,032 | 4,863 | 84,321 | 235,350 | 37,416 | 272,766 | 86.3 | 13.7 | [4] 2,348 | 130 | 867 | 927 | 235 |
| 1962 | 147,962 | 488 | 4,296 | 90,174 | 240,920 | 40,346 | 281,266 | 85.7 | 14.3 | [4] 2,245 | 100 | 825 | 961 | 267 |
| 1963 | 160,303 | 457 | 4,131 | 104,350 | 269,241 | 43,015 | 302,256 | 85.8 | 14.2 | [4] 2,186 | 81 | 680 | 1,030 | 249 |
| 1964 | 152,409 | 313 | 3,702 | 124,677 | 281,101 | 40,707 | 321,808 | 87.4 | 12.6 | [4] 2,159 | 73 | 585 | 1,111 | 257 |

NA Not available.

[1] For separate data by type of loading, see Minerals Yearbook 1959, v. 2, p. 86. Canvass of pit-car loaders discontinued in 1951.

Exclusive of tonnage "Handled by conveyors."

[3] Includes mobile loading machines used in conjunction with continuous mining.

[4] Mobile loading machines used in conjunction with continuous mining shown separately in last column of this table.

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**TABLE 39.—Bituminous coal and lignite mechanically loaded underground in the United States, by type of loading equipment**

| Type of loading equipment | 1963 | | 1964 | |
|---|---|---|---|---|
| | Net tons | Percentage of tons | Net tons | Percentage of tons |
| Mobile machines: | | | | |
| Direct into mine cars | 5,813,032 | 2.2 | 7,093,848 | 2.5 |
| Onto conveyors | 1,926,174 | .7 | 2,770,863 | 1.0 |
| Into shuttle cars | 142,563,644 | 55.0 | 142,544,548 | 50.7 |
| Continuous-mining machines: | | | | |
| Onto conveyors | 19,897,393 | 7.7 | 17,322,123 | 6.2 |
| Into shuttle cars | 84,452,963 | 32.6 | 107,354,917 | 38.2 |
| Scrapers and conveyors equipped with duckbills or other self-loading heads | 457,083 | .2 | 312,595 | .1 |
| Hand-loaded conveyors | 4,130,546 | 1.6 | 3,701,612 | 1.3 |
| Total mechanically loaded | 259,240,835 | 100.0 | 281,100,506 | 100.0 |

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**TABLE 40.—Comparative changes in underground mechanical loading of bituminous coal and lignite by principal types of loading devices in the United States, by States**

| State | Loading machines [1] (net tons) | | Continuous-mining machines (net tons) | | Hand-loaded conveyors (net tons) | | Total mechanically loaded (net tons) | | Total production at mines using mechanical loading devices (net tons) | | Handled by each class (percent) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Loading machines [1] | | Continuous-mining machines | | Hand-loaded conveyors | |
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Alabama | 8,394,704 | 9,445,506 | 163,446 | ---------- | 291,013 | 274,823 | 8,849,163 | 9,720,329 | 8,849,163 | 9,729,822 | 94.9 | 97.2 | 1.8 | ------ | 3.3 | 2.8 |
| Arkansas | ---------- | ---------- | ---------- | ---------- | 75,218 | 73,884 | 75,218 | 73,884 | 75,218 | 73,884 | ------ | ------ | ------ | ------ | 100.0 | 100.0 |
| Colorado | 1,099,281 | 1,341,872 | 1,533,734 | 1,822,837 | 151,649 | 197,892 | 2,784,664 | 3,362,601 | 2,797,904 | 3,363,656 | 39.5 | 39.9 | 55.1 | 54.2 | 5.4 | 5.9 |
| Illinois | 15,624,088 | 16,001,259 | 8,793,343 | 9,011,966 | ---------- | ---------- | 24,417,431 | 25,013,225 | 24,417,431 | 25,013,225 | 64.0 | 64.0 | 36.0 | 36.0 | ------ | ------ |
| Indiana | 3,639,838 | 3,205,040 | 484,276 | 223,268 | ---------- | ---------- | 4,124,114 | 3,428,308 | 4,124,114 | 3,428,308 | 88.3 | 93.5 | 11.7 | 6.5 | ------ | ------ |
| Iowa | 99,661 | 123,359 | ---------- | ---------- | ---------- | ---------- | 99,661 | 123,359 | 99,661 | 123,359 | 100.0 | 100.0 | ------ | ------ | ------ | ------ |
| Kentucky | 27,779,913 | 29,139,050 | 4,344,908 | 6,245,567 | 253,416 | 198,042 | 32,378,237 | 35,582,659 | 32,577,181 | 35,809,788 | 85.8 | 81.9 | 13.4 | 17.5 | .8 | .6 |
| Maryland | 63,427 | 70,855 | 71,809 | 102,211 | 33,303 | 12,270 | 168,539 | 185,336 | 179,434 | 220,691 | 37.6 | 38.2 | 42.6 | 55.2 | 19.8 | 6.6 |
| Montana | 47,410 | 39,388 | ---------- | ---------- | 1,488 | 1,572 | 48,898 | 40,960 | 48,898 | 41,560 | 97.0 | 96.2 | ------ | ------ | 3.0 | 3.8 |
| New Mexico | ---------- | ---------- | 293,371 | 397,574 | 2,052 | 1,472 | 295,423 | 399,046 | 295,423 | 399,046 | ------ | ------ | 99.3 | 99.6 | .7 | .4 |
| Ohio | 5,783,286 | 5,683,120 | 4,059,193 | 4,519,237 | 80,791 | 59,357 | 9,923,270 | 10,261,714 | 9,925,684 | 10,332,730 | 58.3 | 55.4 | 40.9 | 44.0 | .8 | .6 |
| Oklahoma | ---------- | ---------- | 42,126 | ---------- | 8,566 | 6,914 | 50,692 | 6,914 | 50,692 | 6,914 | ------ | ------ | 83.1 | ------ | 16.9 | 100.0 |
| Pennsylvania | 10,620,143 | 10,673,662 | 32,785,676 | 38,831,927 | 1,005,223 | 846,245 | 44,411,042 | 50,351,834 | 44,549,379 | 50,437,033 | 23.9 | 21.2 | 73.8 | 77.1 | 2.3 | 1.7 |
| Tennessee | 1,851,560 | 1,863,974 | 312,115 | 380,752 | 158,094 | 162,747 | 2,321,769 | 2,407,473 | 2,339,269 | 2,410,473 | 79.8 | 77.4 | 13.4 | 15.8 | 6.8 | 6.8 |
| Utah | 2,190,904 | 1,967,536 | 2,166,236 | 2,751,221 | ---------- | ---------- | 4,357,140 | 4,718,757 | 4,357,140 | 4,719,843 | 50.3 | 41.7 | 49.7 | 58.3 | ------ | ------ |
| Virginia | 10,861,818 | 12,071,260 | 2,188,025 | 3,323,982 | 172,229 | 117,401 | 13,222,072 | 15,512,643 | 13,473,874 | 16,309,413 | 82.2 | 77.8 | 16.5 | 21.4 | 1.3 | .8 |
| Washington | 51,634 | 42,125 | 97,967 | ---------- | 33,267 | 25,933 | 182,868 | 68,058 | 182,868 | 68,058 | 28.2 | 61.9 | 53.6 | ------ | 18.2 | 38.1 |
| West Virginia | 62,563,665 | 60,942,161 | 47,014,131 | 57,066,498 | 1,835,309 | 1,709,281 | 111,413,105 | 119,717,940 | 111,814,895 | 120,064,380 | 56.2 | 50.9 | 42.2 | 47.7 | 1.6 | 1.4 |
| Wyoming | 88,601 | 111,687 | ---------- | ---------- | 28,928 | 13,779 | 117,529 | 125,466 | 117,529 | 125,497 | 75.4 | 89.0 | ------ | ------ | 24.6 | 11.0 |
| Total | 150,759,933 | 152,721,854 | 104,350,356 | 124,677,040 | 4,130,546 | 3,701,612 | 259,240,835 | 281,100,506 | 260,275,757 | 282,677,680 | 58.1 | 54.3 | 40.3 | 44.4 | 1.6 | 1.3 |

[1] Includes mobile loading machines, scrapers, and conveyors equipped with duckbills or other self-loading heads.

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**TABLE 41.—Number of bituminous coal and lignite underground mines using mechanical loading devices and number of units in use in the United States, by States**

| State | Number of mines | | | | | | | | | | Number of loading devices | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Using loading machines only [1] | | Using continuous mining machines only | | Using hand-loaded conveyors only | | Using more than one type of mechanical loading | | Total | | Loading machines | | | | Continuous mining machines | | Hand-loaded conveyors (number of units) | |
| | | | | | | | | | | | Mobile [2] | | Scrapers and duckbills or other self-loading conveyors | | | | | |
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Alabama | 14 | 16 | | | 9 | 4 | 2 | 1 | 25 | 21 | 83 | 85 | 4 | 4 | 2 | | 56 | 49 |
| Arkansas | | | | | 6 | 5 | | | 6 | 5 | | | | | | | 16 | 15 |
| Colorado | 35 | 34 | 7 | 8 | 9 | 9 | 7 | 6 | 58 | 57 | 68 | 68 | 19 | 15 | 26 | 26 | 34 | 35 |
| Illinois | 32 | 33 | 4 | 6 | | | 3 | 2 | 39 | 41 | 96 | 104 | 5 | 5 | 41 | 43 | | |
| Indiana | 16 | 16 | | | | | 2 | 2 | 18 | 18 | 60 | 53 | | | 9 | 6 | | |
| Iowa | 2 | 3 | | | | | | | 2 | 3 | 3 | 5 | | | | | | |
| Kentucky | 179 | 248 | 8 | 16 | 18 | 13 | 15 | 12 | 220 | 289 | 411 | 466 | 4 | 6 | 53 | 64 | 40 | 22 |
| Maryland | 1 | 2 | 1 | 2 | 3 | 3 | | | 5 | 7 | 2 | 4 | | | 1 | 2 | 6 | 6 |
| Montana | 9 | 6 | | | 1 | 1 | | | 10 | 7 | 9 | 6 | 9 | 7 | | | 1 | 1 |
| New Mexico | | | 1 | 1 | 1 | 1 | | | 2 | 2 | 4 | 4 | | | 4 | 4 | 1 | 1 |
| Ohio | 17 | 18 | 4 | 4 | 7 | 7 | 5 | 5 | 33 | 34 | 73 | 69 | | 2 | 41 | 45 | 15 | 14 |
| Oklahoma | | | 1 | | 2 | 2 | | | 3 | 2 | | | | | 1 | | 2 | 2 |
| Pennsylvania | 60 | 61 | 65 | 72 | 89 | 75 | 20 | 25 | 234 | 233 | 277 | 270 | 13 | 12 | 337 | 372 | 196 | 169 |
| Tennessee | 17 | 17 | 4 | 3 | 18 | 20 | 1 | | 40 | 40 | 32 | 34 | | | 7 | 7 | 25 | 30 |
| Utah | 24 | 24 | 4 | 4 | | | 7 | 7 | 35 | 35 | 100 | 93 | 3 | 3 | 37 | 42 | | |
| Virginia | 79 | 125 | 6 | 6 | 4 | 4 | 8 | 6 | 97 | 141 | 149 | 197 | 1 | | 23 | 31 | 20 | 9 |
| Washington | 3 | 3 | | | 2 | 2 | 1 | | 6 | 5 | 3 | 3 | | | 3 | | 16 | 4 |
| West Virginia | 290 | 300 | 87 | 97 | 74 | 67 | 89 | 87 | 540 | 551 | 1,062 | 930 | 8 | 4 | 445 | 469 | 229 | 205 |
| Wyoming | 3 | 4 | | | 1 | 1 | 1 | 1 | 5 | 6 | 3 | 5 | 15 | 15 | | | 23 | 23 |
| Total | 781 | 910 | 192 | 219 | 244 | 214 | 161 | 154 | 1,378 | 1,497 | 2,435 | 2,396 | 81 | 73 | 1,030 | 1,111 | 680 | 585 |

[1] Includes mobile loading machines, scrapers, and conveyors equipped with duckbills or other self-loading heads.
[2] Includes mobile loading machines used in conjuction with continuous mining.

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**TABLE 42.—Production at bituminous coal and lignite underground mines in the United States, by States and methods of loading**

| State | Hand loaded (net tons) | | Mechanically loaded (net tons) | | Total underground production (net tons) | | Underground output hand loaded (percent) | | Underground output mechanically loaded (percent) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Alabama | 616,357 | 741,623 | 8,849,163 | 9,720,329 | 9,465,520 | 10,461,952 | 6.5 | 7.1 | 93.5 | 92.9 |
| Arkansas | | | 75,218 | 73,884 | 75,218 | 73,884 | | | 100.0 | 100.0 |
| Colorado | 49,265 | 46,737 | 2,784,664 | 3,362,601 | 2,833,929 | 3,409,338 | 1.7 | 1.4 | 98.3 | 98.6 |
| Georgia | 4,550 | 3,900 | | | 4,550 | 3,900 | 100.0 | 100.0 | | |
| Illinois | 31,575 | 21,251 | 24,417,431 | 25,013,225 | 24,449,006 | 25,034,476 | .1 | .1 | 99.9 | 99.9 |
| Indiana | 36,082 | 24,669 | 4,124,114 | 3,428,308 | 4,160,196 | 3,452,977 | .9 | .7 | 99.1 | 99.3 |
| Iowa | 57,177 | 46,234 | 99,661 | 123,359 | 156,838 | 169,593 | 36.5 | 27.3 | 63.5 | 72.7 |
| Kansas | 1,715 | | | | 1,715 | | 100.0 | | | |
| Kentucky | 15,099,971 | 14,200,187 | 32,378,237 | 35,582,659 | 47,478,208 | 49,782,846 | 31.8 | 28.5 | 68.2 | 71.5 |
| Maryland | 256,970 | 200,189 | 168,539 | 185,336 | 425,509 | 385,525 | 60.4 | 51.9 | 39.6 | 48.1 |
| Missouri | 30,634 | 32,687 | | | 30,634 | 32,687 | 100.0 | 100.0 | | |
| Montana: | | | | | | | | | | |
| Bituminous | 2,890 | 3,581 | 47,576 | 40,960 | 50,466 | 44,541 | 5.7 | 8.0 | 94.3 | 92.0 |
| Lignite | 3,846 | 5,859 | 1,322 | | 5,168 | 5,859 | 74.4 | 100.0 | 25.6 | |
| Total Montana | 6,736 | 9,440 | 48,898 | 40,960 | 55,634 | 50,400 | 12.1 | 18.7 | 87.9 | 81.3 |
| New Mexico | 17,979 | 19,254 | 295,423 | 399,046 | 313,402 | 418,300 | 5.7 | 4.6 | 94.3 | 95.4 |
| North Dakota (lignite) | 1,880 | 1,867 | | | 1,880 | 1,867 | 100.0 | 100.0 | | |
| Ohio | 565,318 | 483,148 | 9,923,270 | 10,261,714 | 10,488,588 | 10,744,862 | 5.4 | 4.5 | 94.6 | 95.5 |
| Oklahoma | 2,668 | 3,829 | 50,692 | 6,914 | 53,360 | 10,743 | 5.0 | 35.6 | 95.0 | 64.4 |
| Pennsylvania | 1,691,388 | 1,624,316 | 44,411,042 | 50,351,834 | 46,102,430 | 51,976,150 | 3.7 | 3.1 | 96.3 | 96.9 |
| Tennessee | 1,057,711 | 1,256,674 | 2,321,769 | 2,407,473 | 3,379,480 | 3,664,147 | 31.3 | 34.3 | 68.7 | 65.7 |
| Utah | 2,391 | 1,086 | 4,357,140 | 4,718,757 | 4,359,531 | 4,719,843 | .1 | | 99.9 | 100.0 |
| Virginia | 13,570,958 | 12,552,159 | 13,222,072 | 15,512,643 | 26,793,030 | 28,064,802 | 50.7 | 44.7 | 49.3 | 55.3 |
| Washington | | | 182,868 | 68,058 | 182,868 | 68,058 | | | 100.0 | 100.0 |
| West Virginia | 9,914,240 | 9,438,127 | 111,413,105 | 119,717,940 | 121,327,345 | 129,156,067 | 8.2 | 7.3 | 91.8 | 92.7 |
| Wyoming | | 31 | 117,529 | 125,466 | 117,529 | 125,497 | | | 100.0 | 100.0 |
| Total | 43,015,565 | 40,707,408 | 259,240,835 | 281,100,506 | 302,256,400 | 321,807,914 | 14.2 | 12.6 | 85.8 | 87.4 |

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**TABLE 43.—Units of mechanical loading equipment sold to bituminous coal and lignite mines for underground use in the United States, as reported by manufacturers**

| Type of equipment | 1960 | 1961 | 1962 | 1963 | 1964 | Change from 1963 (percent) |
|---|---|---|---|---|---|---|
| Mobile loading machines | 110 | 84 | 113 | 89 | 111 | +24.7 |
| Continuous mining machines | 128 | 115 | 149 | 137 | 150 | +9.5 |
| Conveyors [1] | 47 | 66 | 58 | 81 | 70 | −13.6 |
| Number of manufacturers reporting | 18 | 15 | 15 | 15 | 16 | |

[1] Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads.

**TABLE 44.—Units of mechanical loading equipment sold for use in bituminous coal and lignite mines in the United States, as reported by manufacturers, by States**

| State | Mobile loading machines | | Continuous mining machines | | Room conveyors [1] | |
|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Alabama | 8 | 5 | | | | |
| Colorado | 1 | 4 | | 1 | | |
| Illinois | 3 | 6 | 3 | 3 | 1 | |
| Indiana | | 2 | 1 | | | |
| Kentucky | 24 | 24 | 11 | 15 | 3 | 2 |
| Maryland | | | | 1 | | 2 |
| Ohio | | 1 | 4 | 8 | 1 | |
| Pennsylvania | 9 | 17 | 32 | 36 | 26 | 42 |
| Tennessee | 3 | | 4 | 1 | 3 | |
| Utah | | 1 | 2 | 1 | | |
| Virginia | 5 | 4 | 12 | 15 | 11 | 4 |
| West Virginia | 36 | 47 | 68 | 69 | 36 | 20 |
| Total | 89 | 111 | 137 | 150 | 81 | 70 |

[1] Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads.

**TABLE 45.—Units of conveying equipment sold for use in bituminous coal and lignite mines in the United States, as reported by manufacturers, by States**

| State | Bridge conveyors | | Shuttle cars | | Gathering and haulage conveyors [1] | |
|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Alabama | | | 12 | 7 | 2 | |
| Colorado | | | 1 | 1 | 2 | |
| Illinois | | | 8 | 15 | 5 | |
| Indiana | | | | 3 | 3 | |
| Kentucky | 5 | 2 | 41 | 62 | 22 | 29 |
| Maryland | | 1 | | | | |
| Ohio | 1 | | | 6 | 3 | 3 |
| Pennsylvania | 18 | 21 | 28 | 53 | 48 | 56 |
| Tennessee | 5 | | 4 | 1 | 4 | |
| Utah | | | 3 | | 1 | |
| Virginia | 9 | 4 | | 20 | 9 | 18 |
| West Virginia | 16 | 14 | 99 | 143 | 100 | 98 |
| Total | 54 | 42 | 196 | 311 | 199 | 204 |

[1] Includes all gathering and haulage conveyors with a capacity over 500 feet, except main-slope conveyors.

## MECHANICAL CLEANING

Mechanical cleaning means cleaning raw coal with mechanical devices that separate out impurities, usually by differences in specific gravity, and does not include coal that is only screened. Mechanical devices are divided into two general classes—wet and

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pneumatic. About 93 percent of the coal cleaned in 1964 was cleaned by wet methods.

All coal mechanically cleaned in 1964 has been classified into seven types. The percentages of total production cleaned were as follows: Jigs, 47; dense-medium processes, 27; concentrating tables, 13; pneumatic cleaning, 7; and classifiers, launders, and flotation each about 2 percent. Magnetite and sand were most commonly used as mediums in cleaning bituminous coal by the dense-medium processes. Magnetite was used in cleaning 51 million tons, and sand was used in cleaning 30 million tons.

Although mechanical cleaning by froth flotation has been in use at bituminous coal mines in the United States since 1930, it was not until 1960 that the tonnage cleaned by this method was large enough to be listed separately. Bituminous coal cleaned by froth flotation increased from 1,826,000 tons in 1960 to 5,123,000 tons in 1964.

**TABLE 46.—Growth of mechanical cleaning at bituminous coal and lignite mines in the United States**

| Year | Total production (thousand tons) | Mechanical cleaning | | | | | Percentage of total production mechanically cleaned |
|---|---|---|---|---|---|---|---|
| | | Number of cleaning plants | Raw coal (thousand tons) | Cleaned coal (thousand tons) | Refuse (thousand tons) | Percentage of refuse to raw coal | |
| 1927 | 517,763 | NA | NA | 27,692 | NA | NA | 5.3 |
| 1928 | 500,745 | 236 | NA | 28,783 | NA | NA | 5.7 |
| 1929 | 534,989 | 280 | 40,241 | 36,799 | 3,442 | 8.6 | 6.9 |
| 1930 | 467,526 | 297 | 42,645 | 38,800 | 3,845 | 9.0 | 8.3 |
| 1931 | 382,089 | 312 | 39,529 | 36,172 | 3,357 | 8.5 | 9.5 |
| 1932 | 309,710 | 309 | 32,903 | 30,279 | 2,625 | 8.0 | 9.8 |
| 1933 | 333,530 | 290 | 37,682 | 34,558 | 3,124 | 8.3 | 10.4 |
| 1934 | 359,368 | 293 | 43,556 | 39,827 | 3,729 | 8.6 | 11.1 |
| 1935 | 372,373 | 320 | 49,473 | 45,361 | 4,112 | 8.3 | 12.2 |
| 1936 | 439,088 | 342 | 67,162 | 61,095 | 6,067 | 9.0 | 13.9 |
| 1937 | 445,531 | NA | NA | 65,000 | NA | NA | 14.6 |
| 1938 | 348,545 | 374 | 71,207 | 63,455 | 7,752 | 10.9 | 18.2 |
| 1939 | 394,855 | 366 | 88,895 | 79,429 | 9,466 | 10.6 | 20.1 |
| 1940 | 460,771 | 387 | 115,692 | 102,270 | 13,422 | 11.6 | 22.2 |
| 1941 | 514,149 | 417 | 133,379 | 117,540 | 15,839 | 11.9 | 22.9 |
| 1942 | 582,093 | 438 | 162,598 | 142,187 | 20,411 | 12.6 | 24.4 |
| 1943 | 590,177 | 432 | 167,310 | 145,576 | 21,734 | 13.0 | 24.7 |
| 1944 | 619,576 | 439 | 182,071 | 158,727 | 23,344 | 12.8 | 25.6 |
| 1945 | 577,617 | 439 | 172,899 | 147,886 | 25,013 | 14.5 | 25.6 |
| 1946 | 533,922 | 445 | 163,633 | 138,670 | 24,963 | 15.3 | 25.0 |
| 1947 | 630,624 | 461 | 206,620 | 174,436 | 32,184 | 15.6 | 27.7 |
| 1948 | 590,518 | 502 | 215,217 | 189,880 | 34,337 | 16.0 | 30.2 |
| 1949 | 437,908 | 571 | 184,691 | 153,652 | 31,039 | 16.8 | 35.1 |
| 1950 | 516,311 | 612 | 238,391 | 198,699 | 39,692 | 16.7 | 38.5 |
| 1951 | 533,665 | 631 | 289,838 | 240,010 | 49,828 | 17.2 | 45.0 |
| 1952 | 466,841 | 625 | 274,246 | 227,265 | 46,981 | 17.1 | 48.7 |
| 1953 | 457,290 | 611 | 295,654 | 241,759 | 53,895 | 18.2 | 52.9 |
| 1954 | 391,706 | 613 | 287,005 | 232,764 | 54,240 | 18.9 | 59.4 |
| 1955 | 464,633 | 575 | 335,458 | 272,715 | 62,743 | 18.7 | 58.7 |
| 1956 | 500,374 | 583 | 359,378 | 292,365 | 67,013 | 18.6 | 58.4 |
| 1957 | 492,704 | 593 | 376,546 | 304,027 | 72,519 | 19.3 | 61.7 |
| 1958 | 410,446 | 573 | 320,898 | 259,035 | 61,863 | 19.3 | 63.1 |
| 1959 | 412,028 | 555 | 337,138 | 269,787 | 67,351 | 20.0 | 65.5 |
| 1960 | 415,512 | 535 | 337,686 | 273,169 | 65,517 | 19.3 | 65.7 |
| 1961 | 402,977 | 503 | 328,200 | 264,711 | 63,489 | 19.3 | 65.7 |
| 1962 | 422,149 | 508 | 339,408 | 271,633 | 67,775 | 20.0 | 64.3 |
| 1963 | 458,928 | 499 | 362,141 | 289,462 | 72,679 | 20.1 | 63.1 |
| 1964 | 496,908 | 495 | 388,134 | 310,203 | 77,931 | 20.1 | 63.7 |

NA Not available.



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**TABLE 47.—Mechanical cleaning at bituminous coal and lignite mines in the United States, 1964, by States**

| State | Total production (net tons) | Mechanical cleaning | | | | | Percentage of total production mechanically cleaned |
|---|---|---|---|---|---|---|---|
| | | Number of cleaning plants | Raw coal (net tons) | Cleaned (net tons) | Refuse (net tons) | Percentage of refuse to raw coal | |
| Alabama | 14,435,454 | 27 | 17,563,922 | 11,646,246 | 5,917,676 | 33.7 | 80.7 |
| Alaska | 744,942 | 4 | 743,109 | 422,936 | 320,173 | 43.1 | 56.8 |
| Arkansas | 212,315 | 1 | (1) | (1) | (1) | (1) | (1) |
| Colorado | 4,355,245 | 4 | 1,796,348 | 1,448,157 | 348,191 | 19.4 | 33.3 |
| Illinois | 55,022,602 | 56 | 59,179,231 | 47,973,098 | 11,206,133 | 18.9 | 87.2 |
| Indiana | 15,074,631 | 15 | 14,086,835 | 11,597,770 | 2,489,065 | 17.7 | 76.9 |
| Kansas | 1,263,409 | 3 | 1,932,637 | 1,244,022 | 688,615 | 35.6 | 98.5 |
| Kentucky | 82,747,171 | 63 | 51,057,410 | 42,107,116 | 8,950,294 | 17.5 | 50.9 |
| Missouri | 3,253,430 | 6 | 2,735,185 | 1,988,250 | 746,935 | 27.3 | 61.1 |
| Montana (bituminous) | 45,906 | 1 | (1) | (1) | (1) | (1) | (1) |
| New Mexico | 2,969,472 | 1 | 704,043 | 397,574 | 306,469 | 43.5 | 13.4 |
| Ohio | 37,310,377 | 22 | 17,786,362 | 14,201,262 | 3,585,100 | 20.2 | 38.1 |
| Oklahoma | 1,027,996 | 1 | [2] 216,770 | [2] 184,497 | [2] 32,273 | [2] 14.9 | [2] 14.3 |
| Pennsylvania | 76,530,758 | 97 | 65,880,441 | 52,196,058 | 13,684,383 | 20.8 | 68.2 |
| Utah | 4,719,843 | 8 | 3,769,068 | 3,192,444 | 576,624 | 15.3 | 67.6 |
| Virginia | 31,653,484 | 28 | 15,812,104 | 13,270,816 | 2,541,288 | 16.1 | 41.9 |
| Washington | 68,058 | 2 | 98,663 | 64,905 | 33,758 | 34.2 | 96.4 |
| West Virginia | 141,408,498 | 154 | 134,705,688 | 108,203,720 | 26,501,368 | 19.7 | 76.5 |
| Wyoming | 3,101,314 | 2 | 66,544 | 63,871 | 2,673 | 4.0 | 2.1 |
| Other States [3] | 11,053,047 | | | | | | |
| Total | 486,997,952 | 495 | 388,133,760 | 310,202,742 | 77,931,018 | 20.1 | 63.7 |

[1] Included in Oklahoma.
[2] Includes Arkansas and Montana (bituminous).
[3] Includes Georgia, Iowa, Maryland, Tennessee, and lignite from Montana, North Dakota, and South Dakota.

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**TABLE 48.—Mechanical cleaning of bituminous coal and lignite in the United States, by types of equipment**

| Year | Wet methods | | | | | | | Pneumatic methods | Grand total |
|---|---|---|---|---|---|---|---|---|---|
| | Jigs | Concentrating tables | Classifiers | Launders | Dense-medium processes | Unclassified[1] | Total | | |
| **CLEAN COAL (THOUSAND NET TONS)** | | | | | | | | | |
| 1938 | 27,615 | 984 | 4,521 | 10,681 | 4,450 | 4,936 | 53,187 | 10,268 | 63,455 |
| 1939 | 37,056 | 1,402 | 5,917 | 12,809 | 4,683 | 5,867 | 67,734 | 11,695 | 79,429 |
| 1940 | 47,064 | 2,330 | 7,762 | 16,269 | 6,692 | 7,173 | 87,290 | 14,980 | 102,270 |
| 1941 | 53,287 | 2,510 | 8,177 | 16,954 | 9,344 | 10,106 | 100,378 | 17,162 | 117,540 |
| 1942 | 66,876 | 3,138 | 10,529 | 18,658 | 12,495 | 10,304 | 122,000 | 20,187 | 142,187 |
| 1943 | 66,092 | 2,929 | 11,854 | 17,424 | 13,388 | 12,688 | 124,375 | 21,201 | 145,576 |
| 1944 | 74,175 | 2,753 | 14,780 | 19,686 | 12,869 | 13,400 | 138,663 | 20,064 | 158,727 |
| 1945 | 68,609 | 2,594 | 14,203 | 18,980 | 12,875 | 13,209 | 130,470 | 17,416 | 147,886 |
| 1946 | 64,702 | 1,447 | 13,883 | 16,021 | 14,173 | 11,833 | 122,059 | 16,611 | 138,670 |
| 1947 | 85,931 | 2,980 | 14,648 | 17,902 | 17,702 | 16,920 | 156,083 | 18,353 | 174,436 |
| 1948 | 87,506 | 4,360 | 18,304 | 16,788 | 20,638 | 17,068 | 164,664 | 16,216 | 180,880 |
| 1949 | 72,423 | 4,040 | 14,865 | 11,238 | 17,821 | 20,321 | 140,708 | 12,944 | 153,652 |
| 1950 | 94,161 | 4,693 | 18,059 | 11,630 | 28,948 | 25,679 | 183,170 | 15,529 | 198,699 |
| 1951 | 101,746 | 5,811 | 23,174 | 10,362 | 33,840 | 46,497 | 221,430 | 18,580 | 240,010 |
| 1952 | 97,336 | 3,723 | 19,296 | 11,738 | 31,321 | 45,205 | 208,619 | 18,646 | 227,265 |
| 1953 | 101,001 | 4,002 | 18,312 | 11,988 | 36,805 | 50,386 | 222,494 | 19,265 | 241,759 |
| 1954 | 99,913 | 6,606 | 16,115 | 12,156 | 43,104 | 36,143 | 214,037 | 18,727 | 232,764 |
| 1955 | 114,538 | 7,443 | 17,656 | 11,400 | 49,332 | 52,051 | 252,420 | 20,295 | 272,715 |
| 1956 | 124,858 | 9,535 | 15,064 | 10,223 | 56,937 | 51,437 | 268,054 | 24,311 | 292,365 |
| 1957 | 133,844 | 14,389 | 14,282 | 8,306 | 63,678 | 44,760 | 279,259 | 24,768 | 304,027 |
| 1958 | 115,321 | 18,142 | 8,793 | 6,768 | 52,735 | 38,394 | 240,153 | 18,882 | 259,035 |
| 1959 | 126,836 | 27,453 | 8,935 | 7,305 | 66,951 | 14,058 | 251,538 | 18,249 | 269,787 |
| 1960 | 136,633 | 30,741 | 11,012 | 7,561 | 66,251 | 2,832 | 255,030 | 18,139 | 273,169 |
| 1961 | 133,360 | 30,158 | 9,263 | 6,529 | 65,148 | 2,562 | 247,020 | 17,691 | 264,711 |
| 1962 | 136,879 | 31,859 | 5,681 | 5,986 | 68,565 | 3,959 | 252,929 | 18,704 | 271,633 |
| 1963 | 142,540 | 37,492 | 5,558 | 5,221 | 74,177 | 4,539 | 269,527 | 19,935 | 289,462 |
| 1964 | 145,918 | 40,878 | 6,725 | 6,000 | 84,159 | 5,123 | 288,803 | 21,400 | 310,203 |
| **PERCENTAGE CLEANED** | | | | | | | | | |
| 1938 | 43.5 | 1.6 | 7.1 | 16.8 | 7.0 | 7.8 | 83.8 | 16.2 | 100.0 |
| 1939 | 46.6 | 1.8 | 7.5 | 16.1 | 5.9 | 7.4 | 85.3 | 14.7 | 100.0 |
| 1940 | 46.0 | 2.3 | 7.6 | 15.9 | 6.5 | 7.0 | 85.3 | 14.7 | 100.0 |
| 1941 | 45.3 | 2.2 | 7.0 | 14.4 | 7.9 | 8.6 | 85.4 | 14.6 | 100.0 |
| 1942 | 47.0 | 2.2 | 7.4 | 13.1 | 8.8 | 7.3 | 85.8 | 14.2 | 100.0 |
| 1943 | 45.4 | 2.0 | 8.1 | 12.0 | 9.2 | 8.7 | 85.4 | 14.6 | 100.0 |
| 1944 | 46.7 | 1.8 | 9.3 | 12.4 | 8.8 | 8.4 | 87.4 | 12.6 | 100.0 |
| 1945 | 46.4 | 1.8 | 9.6 | 12.8 | 8.7 | 8.9 | 88.2 | 11.8 | 100.0 |
| 1946 | 46.7 | 1.0 | 10.0 | 11.6 | 10.2 | 8.5 | 88.0 | 12.0 | 100.0 |
| 1947 | 49.3 | 1.7 | 8.4 | 10.3 | 10.1 | 9.7 | 89.5 | 10.5 | 100.0 |
| 1948 | 48.4 | 2.4 | 10.1 | 9.3 | 11.4 | 9.4 | 91.0 | 9.0 | 100.0 |
| 1949 | 47.1 | 2.6 | 9.7 | 7.3 | 11.6 | 13.3 | 91.6 | 8.4 | 100.0 |
| 1950 | 47.4 | 2.4 | 9.1 | 5.8 | 14.6 | 12.9 | 92.2 | 7.8 | 100.0 |
| 1951 | 42.4 | 2.4 | 9.7 | 4.3 | 14.1 | 19.4 | 92.3 | 7.7 | 100.0 |
| 1952 | 42.8 | 1.6 | 8.5 | 5.2 | 13.8 | 19.9 | 91.8 | 8.2 | 100.0 |
| 1953 | 41.8 | 1.6 | 7.6 | 4.9 | 15.2 | 20.9 | 92.0 | 8.0 | 100.0 |
| 1954 | 42.8 | 3.0 | 5.7 | 3.9 | 21.8 | 17.9 | 95.1 | 4.9 | 100.0 |
| 1955 | 42.0 | 2.7 | 6.5 | 4.2 | 18.1 | 19.1 | 92.6 | 7.4 | 100.0 |
| 1956 | 42.7 | 3.3 | 5.1 | 3.5 | 19.5 | 17.6 | 91.7 | 8.3 | 100.0 |
| 1957 | 44.0 | 4.8 | 4.7 | 2.7 | 21.0 | 14.7 | 91.9 | 8.1 | 100.0 |
| 1958 | 44.5 | 7.0 | 3.4 | 2.6 | 20.4 | 14.8 | 92.7 | 7.3 | 100.0 |
| 1959 | 47.0 | 10.2 | 3.3 | 2.7 | 24.8 | 5.2 | 93.2 | 6.8 | 100.0 |
| 1960 | 50.0 | 11.3 | 4.0 | 2.8 | 24.3 | 1.0 | 93.4 | 6.6 | 100.0 |
| 1961 | 50.4 | 11.4 | 3.5 | 2.4 | 24.6 | 1.0 | 93.3 | 6.7 | 100.0 |
| 1962 | 50.4 | 11.7 | 2.1 | 2.2 | 25.2 | 1.5 | 93.1 | 6.9 | 100.0 |
| 1963 | 49.2 | 13.0 | 1.9 | 1.8 | 25.6 | 1.6 | 93.1 | 6.9 | 100.0 |
| 1964 | 47.0 | 13.2 | 2.2 | 1.9 | 27.1 | 1.7 | 93.1 | 6.9 | 100.0 |

[1] Of the total unclassified tonnage in 1960, 1,826,000 net tons was cleaned by flotation. In 1961–64, all of the tonnage under "Unclassified" was cleaned by flotation.

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**TABLE 49.—Mechanical cleaning at bituminous coal and lignite mines in the United States, by underground, strip, and auger mining**

| Year | Total production (net tons) | Cleaned | | Total production (net tons) | Cleaned | |
|---|---|---|---|---|---|---|
| | | Net tons | Percent | | Net tons | Percent |
| | Underground mines | | | Strip mines | | |
| 1953 | 349,550,972 | 194,934,569 | 55.8 | 105,445,569 | 46,202,506 | 43.8 |
| 1954 | 286,112,181 | 184,872,053 | 63.6 | 98,134,250 | 47,772,295 | 48.7 |
| 1955 | 343,465,239 | 217,199,139 | 63.2 | 115,582,709 | 54,423,341 | 47.3 |
| 1956 | 365,774,062 | 232,251,914 | 63.5 | 127,165,382 | 58,271,513 | 45.9 |
| 1957 | 366,649,141 | 242,981,445 | 67.4 | 124,106,538 | 59,317,324 | 47.8 |
| 1958 | 264,864,244 | 196,710,826 | 69.3 | 116,241,757 | 58,883,257 | 50.7 |
| 1959 | 263,433,655 | 205,836,017 | 71.9 | 122,953,534 | 64,417,972 | 53.3 |
| 1960 | 284,895,310 | 205,804,076 | 72.2 | 122,629,694 | 66,356,125 | 54.1 |
| 1961 | 272,765,965 | 199,356,507 | 73.1 | 121,979,264 | 64,507,939 | 52.9 |
| 1962 | 261,266,366 | 200,692,754 | 71.3 | 131,870,224 | 69,489,965 | 53.3 |
| 1963 | 302,266,470 | 215,717,996 | 71.4 | 144,142,677 | 72,332,453 | 50.0 |
| 1964 | 321,627,914 | 231,997,577 | 72.1 | 151,856,979 | 76,330,534 | 50.3 |
| | Auger mines | | | Total, all mines | | |
| 1953 | 2,290,906 | 621,470 | 27.1 | 457,290,449 | 241,758,577 | 52.9 |
| 1954 | 4,460,019 | 619,675 | 13.9 | 391,706,300 | 232,764,023 | 59.4 |
| 1955 | 6,055,409 | 1,093,017 | 18.0 | 464,633,406 | 272,715,484 | 58.7 |
| 1956 | 6,044,602 | 1,401,957 | 23.1 | 510,874,077 | 292,365,384 | 58.4 |
| 1957 | 7,946,237 | 1,726,424 | 21.8 | 498,705,916 | 304,027,194 | 61.7 |
| 1958 | 7,319,516 | 1,391,766 | 19.0 | 417,445,547 | 259,034,851 | 63.1 |
| 1959 | 7,640,513 | 1,539,098 | 20.2 | 412,027,702 | 269,793,087 | 65.5 |
| 1960 | 7,964,373 | 1,006,493 | 12.6 | 415,512,347 | 273,166,694 | 65.7 |
| 1961 | 8,231,733 | 850,516 | 10.3 | 402,976,962 | 264,710,942 | 65.7 |
| 1962 | 10,562,733 | 1,479,830 | 14.0 | 422,149,325 | 271,632,599 | 64.3 |
| 1963 | 12,531,096 | 1,711,936 | 13.7 | 458,928,173 | 289,462,405 | 63.1 |
| 1964 | 13,331,059 | 1,665,331 | 14.0 | 486,997,952 | 310,202,742 | 63.7 |

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**TABLE 50.—Mechanical cleaning at bituminous coal and lignite mines in the United States, 1964, by States and by underground, strip, and auger mining**

| State | Underground mines | | | Strip mines | | | Auger mines | | | Total, all mines | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total production (net tons) | Cleaned | | Total production (net tons) | Cleaned | | Total production (net tons) | Cleaned | | Total production (net tons) | Cleaned | |
| | | Net tons | Percent | | Net tons | Percent | | Net tons | Percent | | Net tons | Percent |
| Alabama | 10,461,952 | 9,891,765 | 94.5 | 3,878,014 | 1,671,341 | 43.1 | 95,488 | 83,140 | 87.1 | 14,435,454 | 11,646,246 | 80.7 |
| Alaska | | | | 744,942 | 422,936 | 56.8 | | | | 744,942 | 422,936 | 56.8 |
| Arkansas | 73,884 | (1) | (1) | 138,431 | (1) | (1) | | | | 212,315 | (1) | (1) |
| Colorado | 3,409,338 | 1,441,394 | 42.3 | 945,907 | 6,763 | .7 | | | | 4,355,245 | 1,448,157 | 33.3 |
| Illinois | 25,034,476 | 20,600,206 | 82.3 | 29,988,126 | 27,372,892 | 91.3 | | | | 55,022,602 | 47,973,098 | 87.2 |
| Indiana | 3,452,977 | 2,804,296 | 81.2 | 11,621,654 | 8,793,474 | 75.7 | | | | 15,074,631 | 11,597,770 | 76.9 |
| Kansas | | | | 1,263,409 | 1,244,022 | 98.5 | | | | 1,263,409 | 1,244,022 | 98.5 |
| Kentucky | 49,782,846 | 24,588,011 | 49.4 | 28,304,868 | 17,409,202 | 61.5 | 4,659,457 | 109,903 | 2.4 | 82,747,171 | 42,107,116 | 50.9 |
| Missouri | 32,687 | | | 3,220,743 | 1,968,250 | 61.7 | | | | 3,253,430 | 1,968,250 | 61.1 |
| Montana (bituminous) | 44,541 | (1) | (1) | 1,365 | (1) | (1) | | | | 45,906 | (1) | (1) |
| New Mexico | 418,300 | 397,574 | 95.0 | 2,551,172 | | | | | | 2,969,472 | 397,574 | 13.4 |
| Ohio | 10,744,862 | 6,559,253 | 61.0 | 24,815,302 | 7,268,199 | 29.3 | 1,750,213 | 373,810 | 21.4 | 37,310,377 | 14,201,262 | 38.1 |
| Oklahoma | 10,743 | [2] 7,203 | [2] 5.6 | 1,017,253 | [2] 177,294 | [2] 15.3 | | | | 1,027,996 | [2] 184,497 | [2] 14.3 |
| Pennsylvania | 51,976,150 | 43,637,730 | 84.0 | 23,505,457 | 8,232,294 | 35.0 | 1,049,151 | 326,034 | 31.1 | 76,530,758 | 52,196,058 | 68.2 |
| Utah | 4,719,843 | 3,192,444 | 67.6 | | | | | | | 4,719,843 | 3,192,444 | 67.6 |
| Virginia | 28,064,802 | 12,500,466 | 44.5 | 2,450,755 | 597,807 | 24.4 | 1,137,927 | 172,543 | 15.2 | 31,653,484 | 13,270,816 | 41.9 |
| Washington | 68,058 | 64,905 | 95.4 | | | | | | | 68,058 | 64,905 | 95.4 |
| West Virginia | 129,156,067 | 106,248,459 | 82.3 | 7,867,872 | 1,155,360 | 14.7 | 4,384,559 | 799,901 | 18.2 | 141,408,498 | 108,203,720 | 76.5 |
| Wyoming | 125,497 | 63,871 | 50.9 | 2,975,817 | | | | | | 3,101,314 | 63,871 | 2.1 |
| Other States [3] | 4,230,891 | | | 6,567,892 | | | 254,264 | | | 11,053,047 | | |
| Total | 321,807,914 | 231,997,577 | 72.1 | 151,858,979 | 76,339,834 | 50.3 | 13,331,059 | 1,865,331 | 14.0 | 486,997,952 | 310,202,742 | 63.7 |

[1] Included in Oklahoma.
[2] Includes Arkansas and Montana (bituminous).
[3] Includes Georgia, Iowa, Maryland, Tennessee, and lignite from Montana, North Dakota, and South Dakota.

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## WATER USAGE

The Bureau of Mines collected detailed statistics on water at coal preparation plants for the first time in the year 1962. Table 51 [illegible] States. The principal States in terms of water used were West Virginia, Illinois, [illegible]. By far the major portion [illegible]

[illegible] is shown in table 52. Practically all [illegible] was clarified by thickening [illegible] was filtered.

[illegible] water at coal preparation plants—96 percent—was from self-supplied [illegible] and only an insignificant [illegible]

TABLE 51.—Water usage at bituminous coal and lignite preparation plants in the United States, 1962, by States

| State | Water usage | | | Water disposal | |
|---|---|---|---|---|---|
| | New water | Recirculated water | Total | Consumed | Discharged |
| [illegible] | [illegible] | [illegible] | [illegible] | 382 | 1,975 |
| | | | | 3 | 1,240 |
| | | | | 10 | 4 |
| | | | | 1 | 1 |
| | | | | 427 | 4,477 |
| | | | | 142 | 1,048 |
| | | | | 101 | 48 |
| | | | | 525 | 7,581 |
| | | | | 169 | 134 |
| | | | | | 1 |
| | | | | 4 | 30 |
| | | | | 280 | 255 |
| | | | | 11 | 15 |
| | | | | 708 | 1,194 |
| | | | | | 1 |
| | | | | 636 | 300 |
| | | | | 278 | 1,226 |
| | | | | 4 | 14 |
| | | | | 2,622 | 5,141 |
| | | | | 1 | 1 |
| [illegible] | [illegible] | [illegible] | 170,304 | 5,699 | 26,144 |

TABLE 52.—Water treatment at bituminous coal and lignite preparation plants, by method of treatment

| Method of treatment | Type of Water | | | | | |
|---|---|---|---|---|---|---|
| | New water | | Recirculated water | | Waste water | |
| | Million gallons | Percent | Million gallons | Percent | Million gallons | Percent |
| [illegible] | [illegible] | [illegible] | 1,976 | 1 | 4,179 | [illegible] |
| | | | 139,309 | 82 | 12,284 | |
| | | | 7,940 | 5 | 1,826 | |
| | | | 1,130 | | 10 | (1) |
| | | | 3,607 | | | |
| | | | 3,894 | | 385 | |
| | | | 3,944 | | 221 | |
| | | | 4,120 | | 25 | (1) |
| | | | 320 | (1) | 141 | |
| | | | | | | |
| | | | | | | |

[illegible]

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## MECHANICAL CRUSHING

**TABLE 53.—Mechanical crushing of bituminous coal and lignite at mines in the United States [1]**

| Year | Number of mines crushing coal | Coal crushed (net tons) | Percentage of total production crushed | Year | Number of mines crushing coal | Coal crushed (net tons) | Percentage of total production crushed |
|---|---|---|---|---|---|---|---|
| 1940 | 716 | 35, 251, 061 | 7.7 | 1954 | 982 | 122, 288, 369 | 31.2 |
| 1944 | 814 | 66, 460, 564 | 10.8 | 1955 | 1, 225 | 161, 470, 318 | 34.8 |
| 1945 | 830 | 70, 936, 898 | 12.3 | 1956 | 1, 370 | 172, 389, 802 | 34.4 |
| 1946 | 851 | 66, 663, 732 | 12.5 | 1957 | 1, 452 | 173, 098, 257 | 35.0 |
| 1947 | 904 | 88, 985, 858 | 14.1 | 1958 | 1, 359 | 146, 749, 108 | 35.8 |
| 1948 | 995 | 91, 564, 311 | 15.3 | 1959 | 1, 393 | 151, 225, 633 | 36.7 |
| 1949 | 1, 120 | 77, 327, 691 | 17.7 | 1960 | 1, 348 | 160, 875, 418 | 38.7 |
| 1950 | 1, 210 | 101, 594, 731 | 19.7 | 1961 | 1, 217 | 146, 765, 297 | 36.4 |
| 1951 | 1, 374 | 118, 663, 712 | 22.2 | 1962 | 1, 202 | 159, 654, 414 | 37.8 |
| 1952 | 1, 325 | 106, 102, 158 | 23.2 | 1963 | 1, 288 | 183, 006, 848 | 39.9 |
| 1953 | 1, 239 | 116, 493, 415 | 25.5 | 1964 | 1, 293 | 209, 119, 640 | 42.9 |

[1] Data not available for 1941–43. Lignite and Virginia semianthracite mines are not included in 1940–49.

**TABLE 54.—Mechanical crushing of bituminous coal and lignite at mines in the United States, by States**

| State | Number of mines crushing coal | | Coal crushed (net tons) | | Percentage of total production crushed | |
|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Alabama | 40 | 20 | 4, 952, 341 | 6, 271, 769 | 40.1 | 43.4 |
| Alaska | 4 | 3 | 581, 476 | 471, 206 | 68.1 | 63.3 |
| Arkansas | 7 | 7 | 169, 916 | 186, 719 | 77.0 | 87.9 |
| Colorado | 39 | 45 | 1, 401, 598 | 1, 939, 561 | 38.0 | 44.5 |
| Illinois | 74 | 76 | 22, 050, 617 | 27, 131, 051 | 42.6 | 49.3 |
| Indiana | 29 | 30 | 8, 421, 531 | 10, 433, 882 | 55.8 | 69.2 |
| Iowa | 21 | 21 | 985, 370 | 777, 349 | 79.6 | 79.9 |
| Kansas | 4 | 2 | 762, 486 | 903, 243 | 65.2 | 71.5 |
| Kentucky | 156 | 119 | 25, 058, 206 | 28, 769, 974 | 32.4 | 34.8 |
| Maryland | 12 | 10 | 273, 025 | 225, 153 | 23.5 | 19.8 |
| Missouri | 10 | 9 | 1, 410, 377 | 3, 153, 109 | 44.4 | 96.9 |
| Montana: | | | | | | |
| Bituminous | 8 | 6 | 18, 466 | 16, 799 | 34.5 | 36.6 |
| Lignite | 1 | 1 | 284, 364 | 293, 117 | 98.2 | 97.7 |
| Total Montana | 9 | 7 | 302, 830 | 309, 916 | 88.3 | 89.6 |
| New Mexico | 4 | 4 | 1, 916, 819 | 2, 945, 102 | 98.6 | 99.2 |
| North Dakota (lignite) | 15 | 14 | 1, 767, 238 | 2, 041, 288 | 73.7 | 77.4 |
| Ohio | 115 | 131 | 13, 345, 764 | 18, 232, 543 | 36.3 | 48.8 |
| Oklahoma | 6 | 8 | 701, 469 | 763, 261 | 69.6 | 74.2 |
| Pennsylvania | 280 | 312 | 39, 421, 652 | 38, 750, 879 | 55.1 | 50.6 |
| South Dakota (lignite) | 1 | 1 | 6, 780 | 5, 200 | 40.9 | 40.0 |
| Tennessee | 26 | 17 | 2, 284, 432 | 1, 552, 276 | 37.3 | 25.9 |
| Utah | 34 | 34 | 3, 157, 277 | 3, 419, 829 | 72.4 | 72.5 |
| Virginia | 48 | 40 | 11, 515, 637 | 11, 276, 995 | 37.7 | 35.6 |
| Washington | 5 | 4 | 20, 129 | 7, 084 | 10.6 | 10.4 |
| West Virginia | 338 | 365 | 39, 508, 385 | 46, 601, 370 | 29.8 | 33.0 |
| Wyoming | 11 | 14 | 3, 011, 493 | 2, 990, 881 | 96.4 | 95.5 |
| Total | 1, 288 | 1, 293 | 183, 006, 848 | 209, 119, 640 | 39.9 | 42.9 |

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## WATER USAGE

The Bureau of Mines collected detailed statistics on water at coal preparation plants for the first time in the year 1962. Table 51 gives the water usage and water disposal by States. The principal States, named in order of importance were West Virginia, Illinois, Pennsylvania, Kentucky and Alabama. By far the major portion of the water used was recirculated.

The method of treatment of the water is shown in table 52. Practically none of the new water used at coal preparation plants was treated. The major portion of the recirculated was clarified by thickeners and settling ponds. A small amount was filtered.

The most significant thing about the water at coal preparation plants is that almost all of the water—98 percent—was from self-operated systems. Also, almost no saline water and only an insignificant amount of sewage effluent were used.

**TABLE 51.—Water usage at bituminous coal and lignite preparation plants in the United States, 1962, by States**

(Million gallons)

| State | Water usage | | | Water disposal | |
|---|---|---|---|---|---|
| | New water | Recirculated water | Total | Consumed | Discharged |
| Alabama | 2,330 | 7,363 | 9,693 | 352 | 1,978 |
| Alaska | 1,344 | 132 | 1,476 | 3 | 1,340 |
| California | 18 | 18 | 36 | 10 | 8 |
| Colorado | 5 | 15 | 20 | 1 | 4 |
| Illinois | 5,304 | 22,409 | 27,713 | 427 | 4,877 |
| Indiana | 1,190 | 8,685 | 9,875 | 142 | 1,048 |
| Kansas | 147 | 1,715 | 1,862 | 101 | 46 |
| Kentucky | 8,096 | 14,623 | 22,719 | 535 | 7,561 |
| Missouri | 226 | 1,067 | 1,293 | 109 | 116 |
| Montana | 2 | 20 | 22 | | 2 |
| New Mexico | 41 | 300 | 341 | 4 | 33 |
| Ohio | 645 | 7,091 | 7,736 | 290 | 355 |
| Oklahoma | 26 | 132 | 158 | 11 | 15 |
| Pennsylvania | 2,682 | 23,483 | 26,165 | 768 | 1,914 |
| Tennessee | 1 | | 1 | | 1 |
| Utah | 995 | 1,399 | 2,394 | 626 | 369 |
| Virginia | 1,593 | 8,010 | 9,603 | 278 | 1,316 |
| Washington | 18 | 25 | 43 | 4 | 14 |
| West Virginia | 7,169 | 42,024 | 49,193 | 2,028 | 5,141 |
| Wyoming | 1 | | 1 | | 1 |
| Total | 31,833 | 138,511 | 170,344 | 5,689 | 26,144 |

**TABLE 52.—Water treatment at bituminous coal and lignite preparation plants, 1962, by method of treatment**

| Method of treatment | Type of Water | | | | | |
|---|---|---|---|---|---|---|
| | New water | | Recirculated water | | Waste water | |
| | Million gallons | Percent | Million gallons | Percent | Million gallons | Percent |
| None | 24,688 | 82 | 1,978 | 1 | 4,179 | 22 |
| Settle | 1,489 | 5 | 116,309 | 82 | 12,284 | 64 |
| Filter | 696 | 2 | 7,840 | 5 | 1,808 | 9 |
| Aerate | 128 | 1 | 2,150 | 2 | 10 | (1) |
| Soften | 261 | 1 | 3,607 | 3 | | |
| Control of pH | 2,209 | 7 | 3,904 | 3 | 585 | 3 |
| Precipitate | 339 | 1 | 3,244 | 2 | 221 | 1 |
| Bactericide | 186 | 1 | 3,120 | 2 | 25 | (1) |
| Other | 9 | (1) | 520 | (1) | 141 | 1 |

[1] Less than 1 percent.

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## MECHANICAL CRUSHING

**TABLE 53.—Mechanical crushing of bituminous coal and lignite at mines in the United States [1]**

| Year | Number of mines crushing coal | Coal crushed (net tons) | Percentage of total production crushed | Year | Number of mines crushing coal | Coal crushed (net tons) | Percentage of total production crushed |
|---|---|---|---|---|---|---|---|
| 1940 | 716 | 35,251,061 | 7.7 | 1954 | 982 | 122,288,369 | 31.2 |
| 1944 | 814 | 66,460,564 | 10.8 | 1955 | 1,225 | 161,470,318 | 34.8 |
| 1945 | 830 | 70,936,898 | 12.3 | 1956 | 1,370 | 172,389,802 | 34.4 |
| 1946 | 851 | 66,663,732 | 12.5 | 1957 | 1,452 | 173,098,257 | 35.0 |
| 1947 | 904 | 88,985,858 | 14.1 | 1958 | 1,359 | 146,749,108 | 35.8 |
| 1948 | 995 | 91,564,311 | 15.3 | 1959 | 1,393 | 151,225,633 | 36.7 |
| 1949 | 1,120 | 77,327,691 | 17.7 | 1960 | 1,348 | 160,875,418 | 38.7 |
| 1950 | 1,210 | 101,594,731 | 19.7 | 1961 | 1,217 | 146,765,297 | 36.4 |
| 1951 | 1,374 | 118,663,712 | 22.2 | 1962 | 1,202 | 159,654,414 | 37.8 |
| 1952 | 1,325 | 108,102,158 | 23.2 | 1963 | 1,288 | 183,006,848 | 39.9 |
| 1953 | 1,239 | 116,493,415 | 25.5 | 1964 | 1,298 | 209,119,640 | 42.9 |

[1] Data not available for 1941–43. Lignite and Virginia semianthracite mines are not included in 1940–49.

**TABLE 54.—Mechanical crushing of bituminous coal and lignite at mines in the United States, by States**

| State | Number of mines crushing coal | | Coal crushed (net tons) | | Percentage of total production crushed | |
|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Alabama | 40 | 20 | 4,952,341 | 6,271,769 | 40.1 | 43.4 |
| Alaska | 4 | 3 | 581,476 | 471,206 | 68.1 | 63.3 |
| Arkansas | 7 | 7 | 169,916 | 186,719 | 77.0 | 87.9 |
| Colorado | 39 | 45 | 1,401,598 | 1,939,561 | 38.0 | 44.5 |
| Illinois | 74 | 76 | 22,050,617 | 27,131,051 | 42.6 | 49.3 |
| Indiana | 29 | 30 | 8,421,531 | 10,433,882 | 55.8 | 69.2 |
| Iowa | 21 | 21 | 965,370 | 777,349 | 79.6 | 79.9 |
| Kansas | 4 | 2 | 762,486 | 903,243 | 65.2 | 71.5 |
| Kentucky | 156 | 119 | 25,058,206 | 28,769,974 | 32.4 | 34.8 |
| Maryland | 12 | 10 | 273,025 | 225,153 | 23.5 | 19.8 |
| Missouri | 10 | 9 | 1,410,377 | 3,153,109 | 44.4 | 96.9 |
| Montana: | | | | | | |
| Bituminous | 8 | 6 | 18,466 | 16,799 | 34.5 | 36.6 |
| Lignite | 1 | 1 | 284,364 | 293,117 | 98.2 | 97.7 |
| Total Montana | 9 | 7 | 302,830 | 309,916 | 88.3 | 89.6 |
| New Mexico | 4 | 4 | 1,916,819 | 2,945,102 | 98.6 | 99.2 |
| North Dakota (lignite) | 15 | 14 | 1,767,238 | 2,041,288 | 73.7 | 77.4 |
| Ohio | 115 | 131 | 13,345,764 | 18,222,543 | 36.3 | 48.8 |
| Oklahoma | 6 | 8 | 701,469 | 763,261 | 69.6 | 74.2 |
| Pennsylvania | 280 | 312 | 39,421,652 | 38,750,879 | 55.1 | 50.6 |
| South Dakota (lignite) | 1 | 1 | 6,780 | 5,200 | 40.9 | 40.0 |
| Tennessee | 26 | 17 | 2,284,432 | 1,552,276 | 37.3 | 25.9 |
| Utah | 34 | 34 | 3,157,277 | 3,419,829 | 72.4 | 72.5 |
| Virginia | 48 | 40 | 11,515,637 | 11,276,995 | 37.7 | 35.6 |
| Washington | 5 | 4 | 20,129 | 7,084 | 10.6 | 10.4 |
| West Virginia | 338 | 365 | 39,508,385 | 46,601,370 | 29.8 | 33.0 |
| Wyoming | 11 | 14 | 3,011,493 | 2,960,881 | 96.4 | 95.5 |
| Total | 1,288 | 1,293 | 183,006,848 | 209,119,640 | 39.9 | 42.9 |

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## TREATMENT FOR ALLAYING DUST

**TABLE 55.—Treatment of bituminous coal and lignite at mines for allaying dust in the United States [1]**

| Year | Grand total production (net tons) | Percentage of total production treated | Net tons treated with | | | | |
|---|---|---|---|---|---|---|---|
| | | | Calcium chloride | Oil | Calcium chloride and oil | All other materials | Total |
| 1940 | 460, 771, 500 | 7.7 | 2, 633, 291 | 25, 767, 651 | 4, 428, 113 | 2, 807, 728 | 35, 636, 783 |
| 1941 | 514, 149, 245 | 7.7 | 3, 957, 459 | 29, 258, 462 | 2, 482, 899 | 3, 844, 476 | 39, 543, 296 |
| 1942 | 582, 692, 937 | 6.0 | 10, 132, 809 | 11, 302, 020 | 6, 544, 658 | 7, 148, 064 | 35, 127, 551 |
| 1943 | 590, 177, 069 | 4.5 | 15, 049, 176 | 1, 720, 176 | 1, 947, 219 | 7, 966, 484 | 26, 683, 055 |
| 1944 | 619, 576, 240 | 5.0 | 7, 276, 702 | 13, 188, 883 | 4, 744, 580 | 5, 562, 565 | 30, 772, 730 |
| 1945 | 577, 617, 327 | 5.8 | 5, 115, 090 | 18, 875, 674 | 4, 647, 872 | 4, 910, 602 | 33, 549, 238 |
| 1946 | 533, 922, 068 | 6.9 | 4, 957, 622 | 24, 310, 109 | 3, 193, 070 | 4, 572, 360 | 37, 033, 161 |
| 1947 | 630, 623, 722 | 8.2 | 5, 822, 483 | 34, 667, 571 | 5, 571, 953 | 5, 732, 101 | 51, 794, 108 |
| 1948 | 599, 518, 229 | 8.4 | 6, 275, 121 | 34, 466, 534 | 4, 177, 987 | 5, 462, 054 | 50, 381, 696 |
| 1949 | 437, 868, 036 | 9.5 | 3, 670, 120 | 30, 448, 670 | 4, 380, 961 | 3, 275, 151 | 41, 774, 902 |
| 1950 | 516, 311, 053 | 10.5 | 4, 643, 186 | 41, 688, 159 | 4, 278, 212 | 3, 724, 314 | 54, 333, 871 |
| 1951 | 533, 664, 732 | 11.0 | 4, 694, 938 | 46, 142, 726 | 4, 587, 940 | 3, 172, 205 | 58, 597, 809 |
| 1952 | 466, 840, 782 | 11.0 | 4, 954, 080 | 41, 409, 886 | 3, 432, 199 | 1, 772, 111 | 51, 568, 276 |
| 1953 | 457, 290, 449 | 10.7 | 3, 362, 552 | 40, 671, 431 | 2, 769, 833 | 2, 154, 985 | 48, 958, 801 |
| 1954 | 391, 706, 300 | 14.4 | 2, 959, 979 | 47, 782, 165 | 3, 366, 955 | 2, 255, 872 | 56, 364, 971 |
| 1955 | 464, 633, 408 | 13.5 | 3, 160, 729 | 51, 157, 769 | 5, 696, 447 | 2, 513, 752 | 62, 528, 697 |
| 1956 | 500, 874, 077 | 12.9 | 5, 500, 522 | 52, 008, 545 | 4, 912, 374 | 2, 309, 732 | 64, 731, 173 |
| 1957 | 492, 703, 916 | 12.5 | 4, 112, 934 | 52, 051, 076 | 3, 809, 132 | 1, 852, 051 | 61, 825, 193 |
| 1958 | 410, 445, 547 | 13.0 | 3, 359, 434 | 42, 922, 129 | 4, 122, 397 | 2, 862, 670 | 53, 266, 630 |
| 1959 | 412, 027, 502 | 13.3 | 2, 716, 638 | 45, 139, 888 | 3, 419, 852 | 3, 403, 320 | 54, 679, 698 |
| 1960 | 415, 512, 347 | 13.9 | 4, 576, 176 | 46, 241, 261 | 4, 333, 350 | 2, 469, 508 | 57, 620, 295 |
| 1961 | 402, 976, 802 | 12.3 | 3, 616, 536 | 39, 130, 370 | 3, 448, 677 | 3, 385, 980 | 49, 581, 563 |
| 1962 | 422, 149, 325 | 11.8 | 3, 128, 468 | 39, 822, 318 | 3, 025, 489 | 4, 047, 823 | 50, 024, 098 |
| 1963 | 458, 928, 175 | 11.1 | 2, 405, 209 | 40, 834, 328 | 2, 674, 714 | 5, 254, 795 | 51, 169, 046 |
| 1964 | 486, 997, 952 | 10.7 | 1, 413, 348 | 39, 578, 713 | 2, 641, 817 | 8, 680, 431 | 52, 314, 309 |

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| Year | Number of mines treating with | | | | | Percentage of tonnage treated with | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Calcium chloride | Oil | Calcium chloride and oil | All other materials | Total [2] | Calcium chloride | Oil | Calcium chloride and oil | All other materials | Total |
| 1940 | 51 | 486 | 22 | 62 | 614 | 7.4 | 72.3 | 12.4 | 7.9 | 100.0 |
| 1941 | 67 | 564 | 15 | 58 | 668 | 10.0 | 74.0 | 6.3 | 9.7 | 100.0 |
| 1942 | 167 | 334 | 73 | 117 | 603 | 28.8 | 32.2 | 18.6 | 20.4 | 100.0 |
| 1943 | 212 | 67 | 28 | 101 | 393 | 56.4 | 6.4 | 7.3 | 29.9 | 100.0 |
| 1944 | 145 | 192 | 47 | 83 | 434 | 23.6 | 42.9 | 15.4 | 18.1 | 100.0 |
| 1945 | 105 | 296 | 43 | 67 | 487 | 15.2 | 56.3 | 13.9 | 14.6 | 100.0 |
| 1946 | 79 | 380 | 41 | 51 | 546 | 13.4 | 65.6 | 8.6 | 12.4 | 100.0 |
| 1947 | 67 | 384 | 58 | 45 | 546 | 11.2 | 66.9 | 10.8 | 11.1 | 100.0 |
| 1948 | 68 | 474 | 48 | 46 | 629 | 12.5 | 68.4 | 8.3 | 10.8 | 100.0 |
| 1949 | 91 | 586 | 62 | 34 | 769 | 8.8 | 72.9 | 10.5 | 7.8 | 100.0 |
| 1950 | 106 | 688 | 32 | 45 | 838 | 8.5 | 76.7 | 7.9 | 6.9 | 100.0 |
| 1951 | 98 | 764 | 40 | 27 | 898 | 8.0 | 78.8 | 7.8 | 5.4 | 100.0 |
| 1952 | 101 | 723 | 30 | 20 | 865 | 9.6 | 80.3 | 6.7 | 3.4 | 100.0 |
| 1953 | 81 | 681 | 28 | 26 | 785 | 6.8 | 83.1 | 5.7 | 4.4 | 100.0 |
| 1954 | 83 | 614 | 29 | 29 | 737 | 5.2 | 84.8 | 6.0 | 4.0 | 100.0 |
| 1955 | 63 | 650 | 33 | 28 | 757 | 5.1 | 81.8 | 9.1 | 4.0 | 100.0 |
| 1956 | 73 | 642 | 35 | 30 | 763 | 8.5 | 80.3 | 7.6 | 3.6 | 100.0 |
| 1957 | 71 | 665 | 31 | 34 | 785 | 6.6 | 84.2 | 6.2 | 3.0 | 100.0 |
| 1958 | 60 | 596 | 36 | 33 | 720 | 6.3 | 80.6 | 7.7 | 5.4 | 100.0 |
| 1959 | 54 | 615 | 44 | 37 | 743 | 5.0 | 82.6 | 6.2 | 6.2 | 100.0 |
| 1960 | 64 | 635 | 56 | 26 | 748 | 7.9 | 80.3 | 7.5 | 4.3 | 100.0 |
| 1961 | 48 | 544 | 32 | 32 | 643 | 7.3 | 78.9 | 7.0 | 6.8 | 100.0 |
| 1962 | 36 | 534 | 32 | 44 | 638 | 6.3 | 79.6 | 6.0 | 8.1 | 100.0 |
| 1963 | 32 | 579 | 24 | 35 | 661 | 4.7 | 79.8 | 5.2 | 10.3 | 100.0 |
| 1964 | 19 | 505 | 29 | 41 | 603 | 2.7 | 75.7 | 5.0 | 16.6 | 100.0 |

[1] All items except "Grand total production" exclude lignite and semianthracite, 1940–49. Data for 1940–45 include all mines with an average daily production of 50 tons and all mines with rail or river connections regardless of size. Data for 1946–64 include all mines producing 1,000 or more tons. The figures are reasonably comparable for all years.

[2] Because some mines used more than one method of treatment, this total is not the sum of the individual items.

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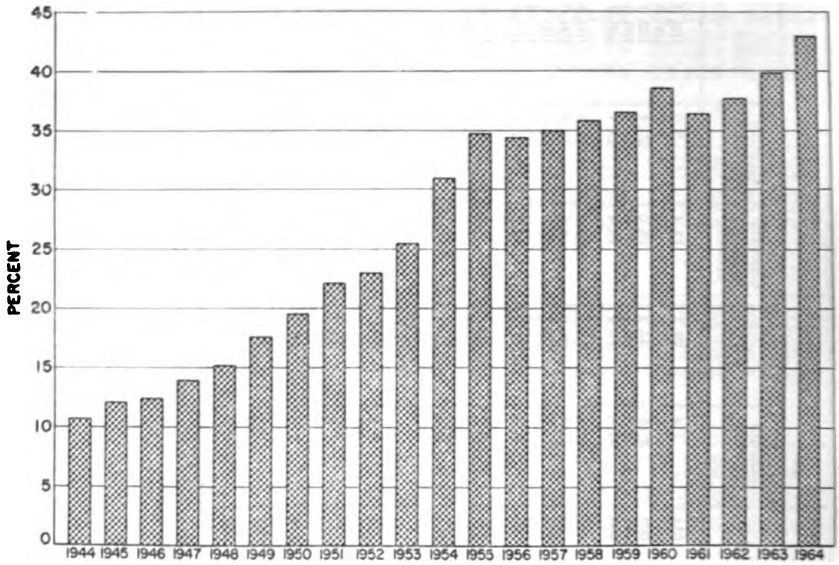


FIGURE 11.—Percentage of total production of bituminous coal and lignite crushed at mines in the United States, 1944–64.

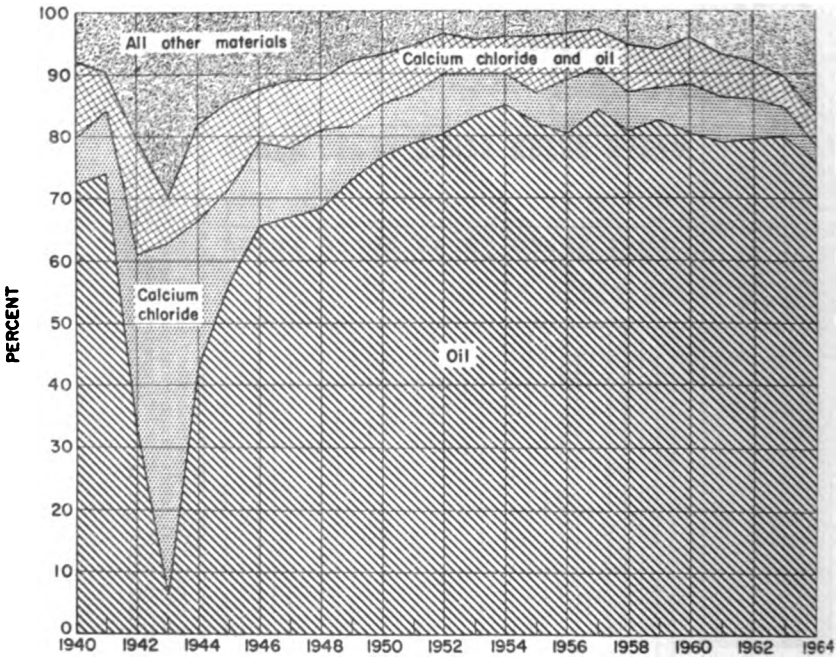


FIGURE 12.—Percentage of total bituminous coal and lignite treated for allaying dust at mines in the United States, 1940–64, by type of agent used.

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TABLE 56.—Treatment of bituminous coal and lignite at mines for allaying dust in the United States, by States

| State | Number of mines treating coal | | Coal treated (net tons) | | Percentage of total production treated | |
|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Alabama | 10 | 3 | 104,817 | 57,935 | 0.8 | 0.4 |
| Arkansas | 1 | | 2,000 | | .9 | |
| Colorado | 34 | 37 | 381,688 | 216,911 | 10.3 | 5.0 |
| Illinois | 66 | 63 | 4,667,196 | 4,874,180 | 9.0 | 8.9 |
| Indiana | 21 | 19 | 845,337 | 1,285,781 | 5.6 | 8.5 |
| Iowa | 5 | 4 | 11,242 | 7,969 | .9 | .8 |
| Kansas | 3 | 3 | 61,445 | 38,053 | 5.3 | 3.0 |
| Kentucky | 102 | 78 | 8,692,444 | 7,840,336 | 11.2 | 9.1 |
| Maryland | 1 | 1 | 10,000 | 9,000 | .9 | .8 |
| Missouri | 4 | 4 | 43,643 | 34,914 | 1.4 | 1.1 |
| Montana: | | | | | | |
| Bituminous | 8 | 6 | 21,474 | 19,434 | 40.2 | 42.3 |
| Lignite | | | | | | |
| Total Montana | 8 | 6 | 21,474 | 19,434 | 6.3 | 5.6 |
| New Mexico | 3 | 3 | 1,612,948 | 2,543,176 | 82.9 | 85.6 |
| North Dakota (lignite) | 19 | 17 | 521,017 | 462,654 | 21.7 | 17.5 |
| Ohio | 37 | 35 | 4,298,301 | 4,654,481 | 11.7 | 12.5 |
| Oklahoma | 2 | 3 | 38,500 | 26,000 | 3.8 | 2.5 |
| Pennsylvania | 81 | 89 | 5,440,680 | 7,229,421 | 7.6 | 9.4 |
| South Dakota (lignite) | 1 | 1 | 6,780 | 5,200 | 40.9 | 40.0 |
| Tennessee | 1 | 1 | 400 | 20,000 | | .3 |
| Utah | 31 | 28 | 1,746,087 | 1,001,697 | 40.1 | 21.2 |
| Virginia | 27 | 25 | 3,379,875 | 2,356,665 | 11.1 | 7.4 |
| Washington | 1 | | 600 | | .3 | |
| West Virginia | 194 | 173 | 19,065,391 | 19,711,692 | 14.4 | 13.9 |
| Wyoming | 9 | 10 | 217,181 | 218,810 | 7.0 | 7.1 |
| Total | 661 | 603 | 51,169,046 | 52,314,209 | 11.1 | 10.7 |

## THERMAL DRYING

Because most of the bituminous coal and lignite produced in the United States is either sprayed with water underground to reduce the dust in mining, cleaned by wet methods, or subjected to wet screening in the tipple, the problem of removing surface moisture is vital. The moisture must be removed for any or all of the following reasons: (1) To avoid freezing difficulties and to facilitate handling the coal during shipment and transfer to the firebox; (2) to reduce the heat wasted in evaporation of surface moisture on the coal, thus increasing efficiency in burning; (3) to decrease transportation costs; (4) to improve the coal so that it may be used for specific purposes, such as producing coke and briquets; and (5) to facilitate drycleaning.

Removal of surface water from fine coal usually presents an individual problem at each preparation plant. Fine coal has a greater surface area per unit weight than coarse coal; therefore, its capacity for retaining moisture is proportionately greater. Removing water from coarse coal is relatively easy, but the problem is greater with coal that is 10 mesh or finer.[4]

The two components of the total moisture content of wetwashed coal are inherent moisture and surface moisture. Inherent moisture is present in the coal in the bed. Surface moisture is attached to the surface of the coal particles or retained in cracks and fissures other than capillary openings in the coal substance.

There are two principal methods of removing surface moisture

[4] Lyons, Orville R. Dewatering and Thermal Drying. Ch. in Coal Preparation. AIME, 2d. ed., 1950 pp. 648-715.

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from coal; mechanical dewatering, and thermal drying. Thermal drying is generally used on coals that cannot be readily dried by mechanical means such as screens, centrifuges, filters, thickeners, cyclones, and others.

The annual reports of bituminous coal and lignite producers to the Bureau of Mines for 1957 included, for the first time, data on thermal drying. These and succeeding reports have included data on thermal drying only at the preparation plant, and have not included thermal drying at powerplants or other industrial plants.

Thermal driers have been divided into seven groups: (1) Continuous-carrier, (2) fluidized bed, (3) multilouvre, (4) rotary, (5) screen, (6) suspension or flash, and (7) vertical tray and cascade.

Each type of thermal drier has been designed to handle a definite range of sizes of coal. The size of coal thermally dried in 1964 ranged from 100 mesh by 0-inch to 1.5 by 0.5 inch. The size most commonly reported was 0.25 by 0-inch coal.

Nineteen percent of the bituminous coal mechanically cleaned in 1964 was thermally dried.

Bituminous coal and lignite thermally dried amounted to 59 million tons, or 12 percent of the total production in the Unites States.

**TABLE 57.—Thermal drying of bituminous coal and lignite in the United States, by type of drying equipment**

| Type of drier | Number of thermal drying units | | Thermally dried (net tons) | | Percentage of total | |
|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Continuous carrier | 4 | 4 | 739,165 | 866,350 | 1.5 | 1.5 |
| Fluidized-bed | 38 | 49 | 14,857,074 | 22,478,004 | 29.4 | 38.3 |
| Multilouvre | 44 | 42 | 9,469,847 | 9,943,032 | 18.7 | 16.9 |
| Rotary | 11 | 9 | 2,549,294 | 1,959,496 | 5.0 | 3.3 |
| Screen | 53 | 52 | 8,760,509 | 8,792,615 | 17.3 | 15.0 |
| Suspension or flash | 49 | 49 | 8,131,081 | 9,154,519 | 16.1 | 15.6 |
| Vertical tray and cascade | 54 | 50 | 6,048,360 | 5,507,522 | 12.0 | 9.4 |
| Total | 253 | 255 | 50,555,330 | 58,701,538 | 100.0 | 100.0 |

**TABLE 58.—Comparison of thermal drying of bituminous coal and lignite with mechanical cleaning at mines in the United States, by States**

| State | Cleaning plants, number | | | | Production mechanically cleaned (net tons) | | Thermally dried (net tons) | | Percentage of cleaned coal thermally dried | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | | With thermal drying | | | | | | | |
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Illinois | 53 | 56 | 23 | 26 | 45,786,182 | 47,973,098 | 8,709,766 | 10,188,039 | 19.0 | 21.2 |
| Indiana | 15 | 15 | 10 | 11 | 11,153,201 | 11,597,770 | 2,977,990 | 3,549,268 | 26.7 | 30.6 |
| Kentucky | 73 | 63 | 7 | 6 | 41,919,493 | 42,107,116 | 2,200,392 | 1,918,723 | 5.2 | 4.6 |
| North Dakota (lignite) | | | | | | | 290,000 | 150,484 | | |
| Ohio | 20 | 22 | 6 | 8 | 13,432,566 | 14,201,262 | 2,460,475 | 3,060,169 | 18.3 | 21.5 |
| Pennsylvania | 89 | 97 | 15 | 15 | 45,132,123 | 52,196,058 | 4,765,130 | 6,927,992 | 10.6 | 13.3 |
| Utah | 7 | 8 | 4 | 4 | 2,914,094 | 3,192,444 | 1,668,009 | 1,211,752 | 57.2 | 38.0 |
| Virginia | 29 | 28 | 3 | 4 | 12,958,882 | 13,270,816 | 3,356,801 | 3,327,882 | 25.9 | 25.1 |
| Washington | 3 | 2 | 1 | ---- | 186,833 | 64,905 | 129,816 | ---------- | 69.5 | ---- |
| West Virginia | 153 | 154 | 53 | 54 | 100,181,839 | 108,203,720 | 23,996,951 | 28,367,229 | 24.0 | 26.2 |
| Other States | 57 | 50 | ---- | ---- | 15,797,192 | 17,395,553 | ---------- | ---------- | ---- | ---- |
| Total | 499 | 495 | 122 | 128 | 289,462,405 | 310,202,742 | 50,555,330 | 58,701,538 | [1] 17.4 | [1] 18.9 |

[1] Excludes North Dakota.

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**TABLE 59.—Thermal drying of bituminous coal and lignite at mines in the United States, by States**

| State | Number of thermal drying units | | Grand total production (net tons) | | Thermally dried (net tons) | | Percentage of total production thermally dried | |
|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Illinois | 53 | 56 | 51,736,316 | 55,022,602 | 8,709,766 | 10,188,039 | 16.8 | 18.5 |
| Indiana | 28 | 29 | 15,099,679 | 15,074,631 | 2,977,990 | 3,549,268 | 19.7 | 23.5 |
| Kentucky | 10 | 9 | 77,350,451 | 82,747,171 | 2,200,392 | 1,918,723 | 2.8 | 2.3 |
| North Dakota (lignite) | 4 | 3 | 2,398,988 | 2,636,751 | 290,000 | 150,484 | 12.1 | 5.7 |
| Ohio | 18 | 19 | 36,789,830 | 37,310,377 | 2,460,475 | 3,060,169 | 6.7 | 11.2 |
| Pennsylvania | 22 | 23 | 71,500,953 | 76,530,758 | 4,765,130 | 6,927,992 | 6.7 | 9.1 |
| Utah | 4 | 4 | 4,359,531 | 4,719,843 | 1,668,009 | 1,211,752 | 38.3 | 25.7 |
| Virginia | 17 | 16 | 30,530,995 | 31,653,484 | 3,356,801 | 3,327,882 | 11.0 | 10.5 |
| Washington | 1 | ----- | 190,225 | 68,058 | 129,816 | ----- | 68.2 | ----- |
| West Virginia | 96 | 96 | 132,567,763 | 141,408,498 | 23,996,951 | 28,367,229 | 18.1 | 20.1 |
| Other States | ----- | ----- | 36,403,444 | 39,825,779 | ----- | ----- | ----- | ----- |
| Total | 253 | 255 | 458,928,175 | 486,997,952 | 50,555,330 | 58,701,538 | 11.0 | 12.1 |

## PRODUCTION BY STATES AND COUNTIES

Detailed production and employment statistics are shown in table 60 for each coal-producing county in the United States from which three or more operators submitted reports. Statistics on counties with less than three reporting producers have been combined with data for "Other counties" to avoid disclosing individual figures, except when the Bureau has been granted permission to publish statistics separately. Production of mines on the border between two States has been credited to the State in which the coal was mined rather than to the State where the tipple was. If the coal was mined in both States, the tonnage was apportioned accordingly.

Bituminous coal and lignite were mined in 25 States and 303 counties. As soft coal is the source of a large part of the economic activity in many counties, the key items pertaining to the industry are published by counties, and are useful in analyzing potential markets. These key items are method of shipping the coal, value, number of men working daily, days worked, and tons per man per day.

The most striking fact illustrated by the following table is the wide variation among several counties in the same State, not only in production but also in average value and average tons per man per day. The differences in average value are due to quality of coal, method of mining, method of transportation, or market conditions. The differences in output per man per day are caused mostly by physical conditions, mining methods, and extent of mechanization.

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**TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1964, by States and counties**

| County | Production (net tons) | | | | Average value per ton [3] | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day [4] |
|---|---|---|---|---|---|---|---|---|---|
| | Shipped by rail or water [1] | Shipped by truck | Used at mine [2] | Total | | | | | |
| **ALABAMA** | | | | | | | | | |
| Bibb | 19,363 | 210,710 | | 230,073 | $4.15 | 105 | 122 | 12,832 | 17.93 |
| Blount | | 2,596 | | 2,596 | 5.49 | 5 | 104 | 519 | 5.00 |
| Cullman | | 8,452 | | 8,452 | 7.56 | 21 | 101 | 2,113 | 4.00 |
| Etowah | 126,560 | | | 126,560 | 5.31 | 32 | 307 | 9,872 | 12.82 |
| Jackson | 88,454 | 75,355 | | 163,809 | 4.73 | 124 | 100 | 12,373 | 13.24 |
| Jefferson | 7,014,020 | 441,081 | 215 | 7,455,316 | 7.52 | 3,174 | 234 | 743,379 | 10.03 |
| Marion | 61,418 | 258,470 | | 319,888 | 4.44 | 476 | 192 | 91,212 | 3.51 |
| St. Clair | | 4,000 | | 4,000 | 2.50 | 5 | 53 | 267 | 14.98 |
| Shelby | 625,519 | 61,360 | | 686,879 | 8.33 | 235 | 252 | 59,163 | 11.61 |
| Tuscaloosa | 929,020 | 172,468 | | 1,101,488 | 4.35 | 124 | 262 | 32,457 | 33.94 |
| Walker | 2,959,147 | 572,483 | 651,263 | 4,182,893 | 6.53 | 1,089 | 198 | 215,483 | 19.41 |
| Winston | 60,000 | 93,500 | | 153,500 | 4.95 | 31 | 248 | 7,675 | 20.00 |
| Total Alabama | 11,883,501 | 1,900,475 | 651,478 | 14,435,454 | 6.83 | 5,421 | 219 | 1,187,345 | 12.16 |
| **ALASKA** | | | | | | | | | |
| Total Alaska | 725,862 | 12,003 | 7,077 | 744,942 | 6.72 | 177 | 267 | 47,208 | 15.78 |
| **ARKANSAS** | | | | | | | | | |
| Franklin | 86,880 | | | 86,880 | 6.77 | 15 | 181 | 2,709 | 32.07 |
| Johnson | 112,905 | 1,980 | | 114,885 | 7.32 | 67 | 209 | 14,020 | 8.19 |
| Sebastian | 10,550 | | | 10,550 | 6.98 | 25 | 141 | 3,516 | 3.00 |
| Total Arkansas | 210,335 | 1,980 | | 212,315 | 7.08 | 107 | 189 | 20,245 | 10.49 |

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|---|---|---|---|---|---|---|---|---|---|
| **COLORADO** | | | | | | | | | |
| Delta | 28,864 | 33,064 | 648 | 62,576 | 5.08 | 32 | 160 | 5,087 | 12.30 |
| El Paso | W | W | W | W | W | W | W | W | W |
| Fremont | 14,777 | 277,917 | 10 | 292,704 | 3.78 | 280 | 85 | 23,886 | 12.25 |
| Garfield | ---------- | 8,234 | ---------- | 8,234 | 7.47 | 14 | 147 | 2,059 | 4.00 |
| Gunnison | 407,489 | 49,924 | 5,572 | 462,985 | 5.94 | 192 | 202 | 38,776 | 11.94 |
| Huerfano | 2,164 | 47,767 | ---------- | 49,921 | 6.10 | 51 | 205 | 10,422 | 4.79 |
| La Plata | ---------- | 26,780 | ---------- | 26,780 | 4.25 | 23 | 166 | 3,826 | 7.00 |
| Las Animas | 776,281 | 23,955 | 1,248 | 801,484 | 6.40 | 410 | 233 | 95,528 | 8.39 |
| Mesa | W | W | W | W | W | W | W | W | W |
| Moffat | W | W | W | W | W | W | W | W | W |
| Montrose | W | W | W | W | W | W | W | W | W |
| Pitkin | W | W | W | W | W | W | W | W | W |
| Rio Blanco | W | W | W | W | W | W | W | W | W |
| Routt | W | W | W | W | W | W | W | W | W |
| Weld | 517,019 | 241,716 | 6,712 | 765,447 | 4.12 | 308 | 194 | 59,754 | 12.81 |
| Other counties | 1,642,810 | 160,740 | 81,564 | 1,885,114 | 5.56 | 403 | 219 | 88,298 | 21.35 |
| Total Colorado | 3,389,394 | 870,097 | 95,754 | 4,355,245 | 5.38 | 1,713 | 191 | 327,636 | 13.29 |
| **GEORGIA** | | | | | | | | | |
| Walker | ---------- | 3,900 | ---------- | 3,900 | 3.82 | 13 | 111 | 1,444 | 2.70 |
| **ILLINOIS** | | | | | | | | | |
| Adams | ---------- | 27,928 | 181 | 28,109 | 6.94 | 13 | 150 | 2,008 | 14.00 |
| Bureau | W | W | W | W | W | W | W | W | W |
| Christian | W | W | W | W | W | W | W | W | W |
| Douglas | W | W | W | W | W | W | W | W | W |
| Franklin | W | W | W | W | W | W | W | W | W |
| Fulton | 6,904,725 | 521,016 | 8,052 | 7,433,793 | 3.91 | 738 | 285 | 210,232 | 35.36 |
| Gallatin | 48,607 | 9,625 | ---------- | 58,232 | 3.25 | 35 | 205 | 7,168 | 8.12 |
| Greene | ---------- | 3,096 | 6 | 3,102 | 5.67 | 6 | 50 | 310 | 10.00 |
| Grundy | W | W | W | W | W | W | W | W | W |
| Henry | W | W | W | W | W | W | W | W | W |
| Jackson | W | W | W | W | W | W | W | W | W |
| Jefferson | W | W | W | W | W | W | W | W | W |
| Knox | W | W | W | W | W | W | W | W | W |
| Logan | ---------- | 21,859 | 40 | 21,899 | 4.98 | 23 | 156 | 3,596 | 6.09 |
| Macoupin | 295,443 | 77,702 | 792 | 373,937 | 3.78 | 156 | 203 | 31,743 | 11.78 |
| Madison | 1,143 | 124,111 | 1,568 | 126,822 | 4.20 | 106 | 100 | 10,569 | 12.00 |
| Menard | W | W | W | W | W | W | W | W | W |
| Mercer | W | W | W | W | W | W | W | W | W |
| Montgomery | W | W | W | W | W | W | W | W | W |

See footnotes at end of table.

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TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1964, by States and counties—Continued

| County | Production (net tons) | | | | Average value per ton [3] | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day [4] |
|---|---|---|---|---|---|---|---|---|---|
| | Shipped by rail or water [1] | Shipped by truck | Used at mine [2] | Total | | | | | |
| **ILLINOIS—Continued** | | | | | | | | | |
| Peoria | 824,064 | 293,425 | 198 | 1,117,687 | $4.86 | 124 | 279 | 34,597 | 32.31 |
| Perry | W | W | W | W | W | W | W | W | W |
| Randolph | W | W | W | W | W | W | W | W | W |
| St. Clair | 4,232,063 | 1,538,121 | 280 | 5,770,464 | 3.55 | 465 | 267 | 124,225 | 46.45 |
| Saline | 3,797,093 | 224,012 | 6,506 | 4,027,611 | 3.73 | 786 | 233 | 183,083 | 22.00 |
| Sangamon | | 79,176 | 110 | 79,286 | 4.41 | 63 | 113 | 7,104 | 11.16 |
| Schuyler | W | W | W | W | W | W | W | W | W |
| Stark | W | W | W | W | W | W | W | W | W |
| Vermilion | W | W | W | W | W | W | W | W | W |
| Wabash | | 1,103 | | 1,103 | 4.10 | 2 | 80 | 160 | 6.89 |
| Washington | W | W | W | W | W | W | W | W | W |
| Will | W | W | W | W | W | W | W | W | W |
| Williamson | 5,942,579 | 460,230 | 15,849 | 6,418,658 | 3.83 | 1,222 | 241 | 294,800 | 21.77 |
| Other counties | 27,594,246 | 1,898,799 | 68,854 | 29,561,899 | 3.75 | 4,433 | 252 | 1,118,762 | 26.42 |
| Total Illinois | 49,639,963 | 5,280,203 | 102,436 | 55,022,602 | 3.79 | 8,172 | 248 | 2,028,357 | 27.13 |
| **INDIANA** | | | | | | | | | |
| Clay | 432,718 | 525,247 | 2,302 | 960,267 | 3.87 | 143 | 263 | 37,554 | 25.57 |
| Daviess | | 11,100 | | 11,100 | 5.00 | 11 | 91 | 1,004 | 11.06 |
| Dubois | | 10,500 | | 10,500 | 3.50 | 4 | 175 | 700 | 15.00 |
| Fountain | W | W | W | W | W | W | W | W | W |
| Gibson | 445,654 | 87,660 | 18,390 | 551,704 | 4.26 | 291 | 182 | 53,048 | 10.40 |
| Greene | 1,465,718 | 81,003 | 5,991 | 1,552,712 | 3.89 | 226 | 270 | 60,986 | 25.46 |
| Knox | | 64,899 | | 64,899 | 3.25 | 54 | 150 | 8,112 | 8.00 |
| Owen | W | W | W | W | W | W | W | W | W |
| Parke | | 7,416 | | 7,416 | 5.93 | 12 | 239 | 2,863 | 2.59 |
| Pike | 2,148,171 | 118,087 | 2,207 | 2,268,465 | 3.76 | 347 | 237 | 82,083 | 27.64 |
| Spencer | 17,706 | 49,981 | 2,758 | 70,445 | 4.65 | 45 | 138 | 6,230 | 11.31 |
| Sullivan | 676,013 | 194,053 | 1,074,646 | 1,944,712 | 4.10 | 484 | 217 | 105,173 | 18.49 |
| Vermillion | | 10,210 | | 10,210 | 6.00 | 31 | 58 | 1,801 | 5.67 |
| Vigo | 293,548 | 238,397 | 310,050 | 841,995 | 4.10 | 302 | 132 | 39,824 | 21.14 |
| Warrick | 5,306,641 | 1,045,987 | 4,503 | 6,357,131 | 3.56 | 549 | 250 | 137,312 | 46.30 |
| Other counties | 323,624 | 99,426 | 25 | 423,075 | 4.30 | 69 | 266 | 18,326 | 23.09 |
| Total Indiana | 11,109,793 | 2,543,966 | 1,420,872 | 15,074,631 | 3.80 | 2,568 | 216 | 555,016 | 27.16 |

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## IOWA

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Appanoose | 11,209 | 27,555 | 728 | 39,582 | 5.40 | 110 | 101 | 11,130 | 3.56 |
| Lucas | 36,755 | 12,968 | ---------- | 49,723 | 4.10 | 17 | 276 | 4,691 | 10.60 |
| Mahaska | 268,959 | 49,327 | 200 | 318,486 | 3.40 | 94 | 205 | 27,840 | 11.44 |
| Marion | 327,967 | 69,720 | ---------- | 397,687 | 3.44 | 74 | 252 | 18,615 | 21.36 |
| Monroe | 19,486 | 75,029 | ---------- | 94,515 | 3.21 | 32 | 202 | 6,459 | 14.63 |
| Van Buren | ---------- | 16,916 | 15 | 16,931 | 4.79 | 8 | 145 | 1,160 | 14.59 |
| Wapello | ---------- | 56,290 | ---------- | 56,290 | 3.43 | 16 | 320 | 5,276 | 10.67 |
| Total Iowa | 664,466 | 307,805 | 943 | 973,214 | 3.54 | 351 | 214 | 75,171 | 12.95 |

## KANSAS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Bourbon | 3,827 | 2,431 | ---------- | 6,258 | 4.00 | 6 | 104 | 626 | 10.00 |
| Cherokee | W | W | W | W | W | W | W | W | W |
| Crawford | W | W | W | W | W | W | W | W | W |
| Other counties | 956,405 | 296,893 | 3,853 | 1,257,151 | 4.55 | 242 | 251 | 60,798 | 20.68 |
| Total Kansas | 960,232 | 299,324 | 3,853 | 1,263,409 | 4.55 | 248 | 248 | 61,424 | 20.57 |

## KENTUCKY

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Eastern Kentucky: | | | | | | | | | |
| Bell | 1,638,377 | 428,793 | 450 | 2,067,620 | 3.41 | 1,140 | 130 | 148,355 | 13.94 |
| Boyd | ---------- | 40,299 | 865 | 41,164 | 3.76 | 36 | 196 | 7,055 | 5.83 |
| Breathitt | 106,563 | 153,601 | ---------- | 260,164 | 3.71 | 230 | 100 | 22,981 | 11.32 |
| Carter | ---------- | 27,006 | ---------- | 27,006 | 3.99 | 35 | 135 | 4,739 | 5.70 |
| Clay | 761,268 | 723,522 | ---------- | 1,484,790 | 3.94 | 892 | 191 | 170,398 | 8.71 |
| Clinton | ---------- | 13,801 | ---------- | 13,801 | 4.20 | 14 | 152 | 2,123 | 6.50 |
| Elliott | ---------- | 13,752 | 100 | 13,852 | 4.59 | 21 | 173 | 3,636 | 3.81 |
| Floyd | 3,855,155 | 816,610 | 7,740 | 4,679,505 | 5.43 | 1,812 | 214 | 387,076 | 12.09 |
| Harlan | 5,116,776 | 519,993 | 5,087 | 5,641,856 | 5.05 | 2,020 | 212 | 428,360 | 13.17 |
| Jackson | ---------- | 44,631 | ---------- | 44,631 | 4.92 | 77 | 62 | 4,807 | 9.28 |
| Johnson | 141,740 | 119,846 | ---------- | 261,586 | 3.23 | 166 | 181 | 30,095 | 8.69 |
| Knott | 1,824,061 | 234,601 | ---------- | 2,058,662 | 3.04 | 1,628 | 99 | 161,704 | 12.73 |
| Knox | 69,628 | 197,310 | ---------- | 266,938 | 3.49 | 330 | 121 | 40,454 | 6.60 |
| Laurel | 117,107 | 19,544 | ---------- | 136,651 | 3.83 | 136 | 89 | 12,080 | 11.31 |
| Lawrence | ---------- | 8,789 | ---------- | 8,789 | 3.31 | 20 | 74 | 1,478 | 5.95 |
| Lee | 5,126 | 55,979 | ---------- | 61,105 | 4.00 | 87 | 170 | 14,831 | 4.12 |
| Leslie | 1,205,270 | 599,679 | 1,582 | 1,806,531 | 4.13 | 858 | 203 | 173,861 | 10.39 |
| Letcher | 4,716,334 | 846,692 | 10,764 | 5,573,790 | 4.35 | 1,730 | 224 | 386,875 | 14.41 |
| McCreary | 415,717 | 49,992 | ---------- | 465,709 | 3.50 | 192 | 219 | 42,108 | 11.06 |
| Magoffin | 38,825 | 56,980 | ---------- | 95,805 | 3.32 | 140 | 88 | 12,330 | 7.77 |
| Martin | 178,176 | 18,350 | ---------- | 196,526 | 4.17 | 81 | 161 | 13,035 | 15.08 |
| Morgan | ---------- | 36,687 | ---------- | 36,687 | 4.65 | 33 | 103 | 3,405 | 10.77 |

See footnotes at end of table.

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**TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1964, by States and counties—Continued**

| County | Production (net tons) | | | | Average value per ton [3] | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day [4] |
|---|---|---|---|---|---|---|---|---|---|
| | Shipped by rail or water [1] | Shipped by truck | Used at mine [2] | Total | | | | | |
| **KENTUCKY—Continued** | | | | | | | | | |
| **Eastern Kentucky—Continued** | | | | | | | | | |
| Owsley | | 9,000 | 200 | 9,200 | $3.00 | 12 | 153 | 1,840 | 5.00 |
| Perry | 3,175,791 | 766,223 | 2,104 | 3,944,118 | 2.86 | 1,246 | 184 | 228,692 | 17.25 |
| Pike | 11,227,190 | 3,583,987 | 24,870 | 14,836,047 | 4.03 | 4,505 | 215 | 969,097 | 15.31 |
| Pulaski | 104,062 | 54,150 | | 158,212 | 3.32 | 59 | 188 | 11,074 | 14.29 |
| Rockcastle | | 1,100 | | 1,100 | 4.20 | 6 | 46 | 275 | 4.00 |
| Wayne | 50,000 | 2,500 | | 52,500 | 2.84 | 50 | 79 | 3,958 | 13.26 |
| Whitley | 405,195 | 233,068 | | 638,263 | 3.12 | 463 | 235 | 108,714 | 5.87 |
| Wolfe | | 8,744 | | 8,744 | 4.20 | 20 | 97 | 1,930 | 4.53 |
| Total Eastern Kentucky | 35,152,361 | 9,685,229 | 53,762 | 44,891,352 | 4.13 | 18,039 | 188 | 3,397,366 | 13.21 |
| **Western Kentucky:** | | | | | | | | | |
| Butler | | 187,038 | | 187,038 | 4.20 | 136 | 108 | 14,713 | 12.71 |
| Christian | 13,573 | | | 13,573 | 5.06 | 9 | 101 | 905 | 15.00 |
| Daviess | 425,869 | 450,732 | | 876,601 | 2.61 | 104 | 256 | 26,649 | 32.89 |
| Hancock | | 1,000 | | 1,000 | 3.24 | 5 | 20 | 100 | 10.00 |
| Henderson | 12,616 | 137,199 | 5,412 | 155,227 | 2.60 | 55 | 217 | 11,922 | 13.02 |
| Hopkins | 9,949,657 | 312,711 | 915 | 10,263,283 | 3.35 | 1,849 | 221 | 408,227 | 25.14 |
| McLean | | 18,498 | | 18,498 | 2.83 | 9 | 103 | 925 | 20.00 |
| Muhlenberg | 13,996,968 | 3,636,777 | 951 | 17,634,696 | 3.19 | 1,334 | 268 | 357,292 | 49.36 |
| Ohio | 4,527,952 | 39,235 | | 4,567,237 | 3.23 | 208 | 298 | 86,424 | 53.04 |
| Union | 4,056,662 | 10,411 | 618 | 4,067,691 | 3.72 | 738 | 257 | 189,421 | 21.47 |
| Webster | 42,157 | 28,828 | | 70,985 | 2.60 | 19 | 147 | 2,791 | 25.43 |
| Total Western Kentucky | 33,025,444 | 4,822,479 | 7,896 | 37,855,819 | 3.29 | 4,551 | 242 | 1,099,369 | 34.43 |
| Total Kentucky | 68,177,805 | 14,507,708 | 61,658 | 82,747,171 | 3.75 | 22,590 | 199 | 4,496,735 | 18.40 |
| **MARYLAND** | | | | | | | | | |
| Allegany | 95,801 | 155,510 | 18 | 251,329 | 4.49 | 115 | 231 | 26,589 | 9.45 |
| Garrett | 523,772 | 360,735 | | 884,507 | 3.82 | 201 | 238 | 47,914 | 18.46 |
| Total Maryland | 619,573 | 516,245 | 18 | 1,135,836 | 3.97 | 316 | 236 | 74,503 | 15.25 |

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## MISSOURI

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Adair | | 26,915 | 500 | 27,415 | 4.83 | 28 | 228 | 6,346 | 4.32 |
| Boone | W | W | W | W | W | W | W | W | W |
| Callaway | | 27,957 | | 27,957 | 4.96 | 7 | 260 | 1,820 | 15.36 |
| Clark | W | W | W | W | W | W | W | W | W |
| Dade | | 17,000 | | 17,000 | 4.74 | 8 | 285 | 2,279 | 7.46 |
| Henry | W | W | W | W | W | W | W | W | W |
| Macon | W | W | W | W | W | W | W | W | W |
| Putman | 37,500 | 99,254 | | 136,754 | 3.73 | 50 | 217 | 10,874 | 12.58 |
| St. Clair | W | W | W | W | W | W | W | W | W |
| Vernon | 48,015 | 4,939 | 10 | 52,964 | 3.84 | 35 | 151 | 5,296 | 10.00 |
| Other counties | 1,691,597 | 262,278 | 1,037,465 | 2,991,340 | 4.09 | 338 | 247 | 83,541 | 35.81 |
| Total Missouri | 1,777,112 | 438,343 | 1,037,975 | 3,253,430 | 4.08 | 466 | 236 | 110,156 | 29.53 |

## MONTANA

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Bituminous coal: | | | | | | | | | |
| Big Horn | W | W | W | W | W | W | W | W | W |
| Blaine | | 2,941 | 40 | 2,981 | 9.00 | 8 | 150 | 1,232 | 2.42 |
| Carbon | W | W | W | W | W | W | W | W | W |
| Musselshell | | 31,385 | 110 | 31,495 | 7.20 | 29 | 140 | 4,069 | 7.74 |
| Other counties | 4,125 | 7,221 | 84 | 11,430 | 7.55 | 24 | 93 | 2,231 | 5.12 |
| Total bituminous coal | 4,125 | 41,547 | 234 | 45,906 | 7.40 | 61 | 123 | 7,532 | 6.09 |
| Lignite: | | | | | | | | | |
| Custer | W | W | W | W | W | W | W | W | W |
| Powder River | | 1,374 | 5 | 1,379 | 4.98 | 2 | 240 | 480 | 2.87 |
| Richland | W | W | W | W | W | W | W | W | W |
| Sheridan | | 2,476 | | 2,476 | 4.00 | 4 | 170 | 678 | 3.65 |
| Other counties | 293,117 | 2,969 | | 296,086 | 1.92 | 23 | 200 | 4,589 | 64.52 |
| Total lignite | 293,117 | 6,819 | 5 | 299,941 | 1.95 | 29 | 198 | 5,747 | 52.19 |
| Total Montana | 297,242 | 48,366 | 239 | 345,847 | 2.68 | 90 | 148 | 13,279 | 26.04 |

## NEW MEXICO

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Colfax | 397,172 | 4,663 | 402 | 402,237 | 9.09 | 131 | 196 | 25,686 | 15.66 |
| McKinley | W | W | W | W | W | W | W | W | W |
| Rio Arriba | W | W | W | W | W | W | W | W | W |
| Sandoval | W | W | W | W | W | W | W | W | W |
| San Juan | W | W | W | W | W | W | W | W | W |
| Other counties | 437,866 | 2,129,369 | | 2,567,235 | 2.38 | 176 | 236 | 41,531 | 61.81 |
| Total New Mexico | 835,038 | 2,134,032 | 402 | 2,969,472 | 3.29 | 307 | 219 | 67,217 | 44.18 |

See footnotes at end of table.

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**TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1964, by States and counties—Continued**

| County | Production (net tons) | | | | Average value per ton [3] | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day [4] |
|---|---|---|---|---|---|---|---|---|---|
| | Shipped by rail or water [1] | Shipped by truck | Used at mine [2] | Total | | | | | |
| **NORTH DAKOTA (LIGNITE)** | | | | | | | | | |
| Adams | 7,626 | 8,011 | | 15,637 | $3.33 | 4 | 250 | 1,117 | 14.00 |
| Bowman | 139,867 | | | 139,867 | 1.89 | 10 | 213 | 2,109 | 66.32 |
| Burke | W | W | W | W | W | W | W | W | W |
| Burleigh | | 7,988 | | 7,988 | 3.34 | 4 | 100 | 399 | 20.00 |
| Dunn | | 2,609 | 200 | 2,809 | 3.00 | 3 | 100 | 312 | 9.00 |
| Grant | | 19,930 | | 19,930 | 2.99 | 7 | 135 | 997 | 20.00 |
| Hettinger | | 2,919 | | 2,919 | 3.16 | 1 | 150 | 146 | 20.00 |
| McLean | 6,568 | 41,274 | | 47,842 | 3.37 | 16 | 64 | 1,016 | 47.09 |
| Mercer | W | W | W | W | W | W | W | W | W |
| Morton | W | W | W | W | W | W | W | W | W |
| Oliver | W | W | W | W | W | W | W | W | W |
| Stark | | 88,848 | | 88,848 | 1.66 | 15 | 150 | 2,221 | 40.00 |
| Ward | W | W | W | W | W | W | W | W | W |
| Williams | | 1,867 | | 1,867 | 4.62 | 5 | 75 | 373 | 5.01 |
| Other counties | 1,859,237 | 162,815 | 286,992 | 2,309,044 | 2.13 | 215 | 219 | 47,109 | 49.01 |
| Total North Dakota | 2,013,298 | 336,261 | 287,192 | 2,636,751 | 2.15 | 280 | 199 | 55,799 | 47.25 |
| **OHIO** | | | | | | | | | |
| Athens | 63,056 | 83,785 | | 146,841 | 3.93 | 89 | 220 | 19,503 | 7.51 |
| Belmont | 7,675,565 | 158,026 | 1,017 | 7,834,638 | 4.01 | 2,087 | 236 | 494,705 | 15.84 |
| Carroll | 119,576 | 146,984 | 5,329 | 271,089 | 3.37 | 92 | 251 | 16,163 | 16.81 |
| Columbiana | 264,435 | 1,263,815 | | 1,528,250 | 3.17 | 295 | 283 | 83,383 | 18.33 |
| Coshocton | 621,417 | 511,867 | 1,168,927 | 2,302,211 | 4.12 | 267 | 286 | 76,314 | 30.17 |
| Gallia | 569,104 | 45,570 | | 614,674 | 3.02 | 154 | 309 | 47,605 | 12.91 |
| Guernsey | 258,869 | 49,453 | | 308,322 | 3.35 | 91 | 174 | 15,814 | 19.50 |
| Harrison | 6,970,330 | 671,430 | 20,087 | 7,662,747 | 4.08 | 2,036 | 206 | 419,177 | 18.28 |
| Hocking | | 78,502 | 100 | 78,602 | 3.31 | 45 | 172 | 7,751 | 10.14 |
| Holmes | 129,134 | 75,886 | | 205,020 | 3.04 | 36 | 312 | 11,216 | 18.28 |
| Jackson | 11,524 | 551,859 | 100 | 563,483 | 3.45 | 657 | 210 | 138,002 | 4.08 |
| Jefferson | 2,807,982 | 1,500,127 | 239 | 4,308,348 | 3.61 | 712 | 250 | 177,773 | 24.24 |
| Lawrence | W | W | W | W | W | W | W | W | W |
| Mahoning | 17,420 | 770,318 | 1,670 | 789,408 | 3.67 | 161 | 329 | 52,839 | 14.94 |
| Meigs | 2,250 | 402,700 | 778 | 405,728 | 2.82 | 147 | 159 | 22,012 | 18.43 |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Morgan | | 14,841 | 1,855,233 | 1,870,074 | 2.99 | 147 | 350 | 51,574 | 36.26 |
| Muskingum | | 116,087 | | 116,087 | 4.27 | 82 | 187 | 15,352 | 7.56 |
| Noble | 1,205,792 | 710,200 | 800,442 | 2,722,434 | 2.99 | 232 | 276 | 63,969 | 42.56 |
| Perry | W | W | W | W | W | W | W | W | W |
| Portage | | 62,628 | | 62,628 | 3.49 | 17 | 310 | 5,362 | 11.68 |
| Stark | | 404,051 | 2,915 | 406,966 | 3.19 | 90 | 280 | 25,218 | 16.14 |
| Tuscarawas | 312,126 | 2,135,441 | 21,577 | 2,469,144 | 3.36 | 644 | 279 | 179,484 | 13.76 |
| Vinton | 10,389 | 149,579 | | 159,968 | 3.78 | 76 | 228 | 17,327 | 9.23 |
| Wayne | | 52,062 | | 52,062 | 2.76 | 59 | 126 | 7,437 | 7.00 |
| Other counties | 1,568,639 | 847,414 | 15,000 | 2,431,053 | 3.71 | 225 | 293 | 65,932 | 36.87 |
| Total Ohio | 22,607,438 | 10,802,625 | 3,900,314 | 37,310,377 | 3.69 | 8,421 | 239 | 2,013,972 | 18.53 |

## OKLAHOMA

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Craig | 299,771 | 23,321 | | 323,092 | 3.11 | 81 | 279 | 22,641 | 14.27 |
| Haskell | W | W | W | W | W | W | W | W | W |
| Le Flore | 7,950 | 2,793 | | 10,743 | 7.43 | 29 | 117 | 3,357 | 3.20 |
| Muskogee | | 1,350 | | 1,350 | 5.30 | 3 | 113 | 338 | 4.00 |
| Okmulgee | | 1,700 | | 1,700 | 5.29 | 2 | 53 | 106 | 16.04 |
| Rogers | W | W | W | W | W | W | W | W | W |
| Other counties | 690,270 | 841 | | 691,111 | 6.33 | 132 | 221 | 29,128 | 23.73 |
| Total Oklahoma | 997,991 | 30,005 | | 1,027,996 | 5.32 | 247 | 225 | 55,570 | 18.50 |

## PENNSYLVANIA

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Allegheny | 3,373,834 | 1,342,845 | 115,815 | 4,832,494 | 5.42 | 1,325 | 224 | 297,102 | 16.27 |
| Armstrong | 2,382,048 | 1,670,175 | 267,931 | 4,320,154 | 4.23 | 1,173 | 197 | 230,495 | 18.74 |
| Beaver | 16,629 | 477,734 | | 494,363 | 3.41 | 131 | 263 | 34,402 | 14.37 |
| Bedford | | 284,630 | | 284,630 | 3.49 | 108 | 263 | 28,358 | 10.04 |
| Blair | 1,250 | 9,984 | | 11,234 | 4.77 | 19 | 152 | 2,885 | 3.89 |
| Bradford | W | W | W | W | W | W | W | W | W |
| Butler | 897,716 | 928,659 | 338 | 1,826,713 | 3.69 | 422 | 221 | 93,161 | 19.61 |
| Cambria | 7,786,428 | 689,713 | 265,129 | 8,741,270 | 5.51 | 3,522 | 234 | 825,749 | 10.59 |
| Cameron | W | W | W | W | W | W | W | W | W |
| Centre | 373,358 | 242,358 | 5,227 | 600,943 | 3.66 | 188 | 247 | 46,518 | 12.92 |
| Clarion | 2,293,332 | 873,700 | 7,466 | 3,174,498 | 3.48 | 697 | 268 | 186,526 | 17.02 |
| Clearfield | 6,073,594 | 1,211,911 | 2,666 | 7,288,171 | 3.66 | 1,980 | 221 | 437,435 | 16.66 |
| Clinton | 362,056 | 117,223 | 2,733 | 482,012 | 3.52 | 73 | 263 | 19,207 | 25.10 |
| Elk | 103,197 | 336,902 | 280 | 440,379 | 3.47 | 156 | 220 | 34,320 | 12.83 |
| Fayette | 1,440,413 | 362,987 | 30,444 | 1,833,844 | 5.76 | 990 | 242 | 239,934 | 7.64 |
| Greene | 11,440,997 | 138,120 | 9,225 | 11,588,342 | 6.18 | 3,615 | 231 | 836,012 | 13.86 |
| Huntingdon | | 67,614 | | 67,614 | 3.31 | 31 | 165 | 5,117 | 13.21 |
| Indiana | 4,516,965 | 664,935 | 327,572 | 5,509,472 | 4.48 | 1,690 | 218 | 367,673 | 14.98 |
| Jefferson | 1,743,422 | 139,714 | 8,212 | 1,891,348 | 3.53 | 547 | 210 | 114,650 | 16.50 |
| Lawrence | | 840,880 | | 840,880 | 3.01 | 162 | 263 | 42,638 | 19.72 |

See footnotes at end of table.

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**TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1964, by States and counties—Continued**

| County | Production (net tons) | | | | Average value per ton [3] | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day [4] |
|---|---|---|---|---|---|---|---|---|---|
| | Shipped by rail or water [1] | Shipped by truck | Used at mine [2] | Total | | | | | |
| **PENNSYLVANIA—Continued** | | | | | | | | | |
| Lycoming | W | W | W | W | W | W | W | W | W |
| McKean | ---------- | 21,700 | ---------- | 21,700 | $3.60 | 22 | 100 | 2,170 | 10.00 |
| Mercer | 240,276 | 346,375 | 129 | 586,780 | 3.87 | 117 | 313 | 36,651 | 16.01 |
| Somerset | 2,572,519 | 585,206 | 10,485 | 3,168,210 | 4.48 | 989 | 188 | 185,862 | 17.05 |
| Tioga | W | W | W | W | W | W | W | W | W |
| Venango | 285,161 | 205,883 | 15 | 491,059 | 4.03 | 79 | 222 | 17,503 | 28.06 |
| Washington | 11,477,525 | 1,912,428 | 69,923 | 13,459,876 | 6.32 | 3,941 | 232 | 915,434 | 14.70 |
| Westmoreland | 3,225,076 | 411,112 | 444,425 | 4,080,613 | 5.14 | 1,221 | 220 | 268,782 | 15.18 |
| Other counties | 48,546 | 445,613 | ---------- | 494,159 | 4.27 | 151 | 240 | 36,282 | 13.62 |
| Total Pennsylvania | 60,634,342 | 14,328,401 | 1,568,015 | 76,530,758 | 5.07 | 23,349 | 227 | 5,304,866 | 14.43 |
| **SOUTH DAKOTA (LIGNITE)** | | | | | | | | | |
| Dewey | ---------- | 12,700 | 300 | 13,000 | 4.85 | 8 | 163 | 1,300 | 10.00 |
| **TENNESSEE** | | | | | | | | | |
| Anderson | 1,045,260 | 737,067 | 43 | 1,782,390 | 3.86 | 506 | 202 | 102,378 | 17.41 |
| Bledsoe | 3,769 | 5,950 | ---------- | 9,719 | 3.31 | 10 | 200 | 1,944 | 5.00 |
| Campbell | 697,592 | 310,118 | 350 | 1,008,060 | 3.43 | 231 | 161 | 45,293 | 22.26 |
| Clairborne | 324,738 | 39,451 | ---------- | 364,189 | 3.55 | 154 | 195 | 30,009 | 12.14 |
| Cumberland | 10,800 | 5,835 | ---------- | 16,635 | 3.15 | 29 | 98 | 2,878 | 5.78 |
| Fentress | 41,328 | 9,000 | ---------- | 50,328 | 3.75 | 126 | 100 | 12,582 | 4.00 |
| Grundy | 288,537 | 43,887 | ---------- | 332,424 | 3.92 | 66 | 285 | 18,931 | 17.56 |
| Hamilton | ---------- | 29,618 | ---------- | 29,618 | 3.86 | 88 | 97 | 8,523 | 3.48 |
| Marion | 476,864 | 61,380 | ---------- | 538,244 | 4.64 | 246 | 188 | 46,261 | 11.63 |
| Morgan | 37,657 | 325,203 | 3,192 | 366,052 | 3.52 | 824 | 243 | 199,336 | 1.83 |
| Overton | 33,166 | 5,257 | ---------- | 38,423 | 3.11 | 29 | 175 | 5,042 | 7.62 |
| Putnam | 439,049 | 38,727 | ---------- | 477,776 | 3.73 | 118 | 217 | 25,563 | 18.69 |
| Rhea | ---------- | 24,400 | ---------- | 24,400 | 3.90 | 54 | 100 | 5,422 | 4.50 |
| Scott | 528,478 | 72,176 | ---------- | 600,654 | 3.79 | 340 | 176 | 60,376 | 10.17 |
| Sequatchie | ---------- | 67,121 | 20 | 67,141 | 3.42 | 98 | 127 | 12,480 | 5.38 |
| Van Buren | 175,358 | 108,994 | ---------- | 284,352 | 3.70 | 63 | 200 | 12,602 | 22.56 |
| Total Tennessee | 4,102,596 | 1,884,204 | 3,605 | 5,990,405 | 3.79 | 3,032 | 196 | 590,120 | 10.15 |

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## UTAH

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Carbon | 3,552,634 | 180,205 | 19,515 | 3,752,354 | 7.43 | 1,325 | 195 | 258,427 | 14.52 |
| Emery | 654,849 | 184,275 | 8,397 | 847,521 | 5.53 | 312 | 220 | 68,681 | 12.34 |
| Iron | | 53,747 | | 53,747 | 4.65 | 22 | 266 | 5,842 | 9.20 |
| Kane | | 1,855 | 28 | 1,883 | 5.34 | 1 | 269 | 269 | 7.00 |
| Sevier | | 47,000 | | 47,000 | 6.08 | 9 | 209 | 1,880 | 25.00 |
| Summit | | 17,298 | 40 | 17,338 | 4.68 | 10 | 247 | 2,477 | 7.00 |
| Total Utah | 4,207,483 | 484,380 | 27,980 | 4,719,843 | 7.03 | 1,679 | 201 | 337,576 | 13.98 |

## VIRGINIA

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Buchanan | 12,093,784 | 2,406,383 | 1,438 | 14,501,605 | 3.96 | 5,156 | 242 | 1,245,500 | 11.64 |
| Dickenson | 7,586,205 | 142,276 | | 7,728,481 | 3.69 | 1,534 | 229 | 351,823 | 21.97 |
| Lee | 412,877 | 57,601 | 812 | 471,290 | 3.88 | 454 | 178 | 80,715 | 5.84 |
| Montgomery | | 7,846 | | 7,846 | 3.55 | 20 | 98 | 1,962 | 4.00 |
| Russell | 1,554,067 | 345,511 | | 1,899,578 | 3.85 | 529 | 241 | 127,624 | 14.88 |
| Scott | | 4,300 | | 4,300 | 3.91 | 19 | 75 | 1,433 | 3.00 |
| Tazewell | 196,919 | 39,668 | | 236,587 | 3.33 | 161 | 226 | 36,466 | 6.49 |
| Wise | 5,488,515 | 1,100,493 | 214,789, | 6,803,797 | 4.01 | 1,485 | 223 | 331,693 | 20.51 |
| Total Virginia | 27,332,367 | 4,104,078 | 217,039 | 31,653,484 | 3.89 | 9,358 | 233 | 2,177,216 | 14.54 |

## WASHINGTON

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| King | W | W | W | W | W | W | W | W | W |
| Lewis | W | W | W | W | W | W | W | W | W |
| Thurston | | 8,991 | | 8,991 | 7.00 | 6 | 250 | 1,499 | 6.00 |
| Other counties | 18,696 | 40,371 | | 59,067 | 8.67 | 70 | 154 | 10,797 | 5.47 |
| Total Washington | 18,696 | 49,362 | | 68,058 | 8.45 | 76 | 162 | 12,296 | 5.53 |

## WEST VIRGINIA

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Barbour | 2,313,381 | 14,090 | 163 | 2,327,634 | 4.34 | 630 | 221 | 139,539 | 16.68 |
| Boone | 8,429,331 | 154,607 | 9,558 | 8,593,496 | 4.47 | 1,821 | 241 | 438,166 | 19.61 |
| Braxton | 70,429 | 3,501 | | 73,930 | 4.39 | 84 | 63 | 5,315 | 13.91 |
| Brooke | 159,407 | 350,633 | 519,971 | 1,030,011 | 3.32 | 231 | 266 | 61,344 | 16.79 |
| Clay | 65,666 | 7,145 | | 72,811 | 4.13 | 70 | 135 | 9,477 | 7.68 |
| Fayette | 5,336,698 | 388,429 | 13,233 | 5,738,360 | 4.51 | 2,171 | 228 | 495,477 | 11.58 |
| Gilmer | W | W | W | W | W | W | W | W | W |
| Grant | W | W | W | W | W | W | W | W | W |
| Greenbrier | 897,069 | 47,258 | 215 | 944,542 | 4.31 | 388 | 215 | 83,231 | 11.35 |
| Hancock | | 34,620 | | 34,620 | 2.66 | 15 | 150 | 2,308 | 15.00 |
| Harrison | 8,171,624 | 114,379 | 561 | 8,286,564 | 4.15 | 1,791 | 228 | 408,071 | 20.31 |

**See footnotes at end of table.**

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**TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1964, by States and counties - Continued**

| County | Production (net tons) | | | | Average value per ton [3] | Average number of men working daily | Average number of days worked | Number of man-days worked | Average tons per man per day [4] |
|---|---|---|---|---|---|---|---|---|---|
| | Shipped by rail or water [1] | Shipped by truck | Used at mine [2] | Total | | | | | |
| WEST VIRGINIA—Continued | | | | | | | | | |
| Kanawha | 10,812,522 | 186,121 | 3,174 | 11,001,817 | $4.47 | 2,534 | 226 | 571,002 | 16.62 |
| Lewis | 109,016 | 48,367 | 12,376 | 169,759 | 3.42 | 83 | 124 | 10,318 | 16.45 |
| Lincoln | 18,393 | | | 18,393 | 2.45 | 15 | 102 | 1,530 | 12.00 |
| Logan | 15,863,623 | 14,073 | 7,031 | 15,885,027 | 4.52 | 4,545 | 235 | 1,069,516 | 14.85 |
| Marion | 11,688,993 | 51,851 | 26,969 | 11,767,813 | 5.18 | 2,675 | 245 | 654,408 | 17.98 |
| Marshall | W | W | W | W | W | W | W | W | W |
| Mason | 301,467 | 156,136 | 268 | 457,871 | 3.30 | 167 | 225 | 37,825 | 12.20 |
| McDowell | 16,976,460 | 221,185 | 112,297 | 17,309,948 | 6.10 | 4,644 | 244 | 1,131,502 | 15.26 |
| Mercer | 1,425,051 | 34,685 | 2,658 | 1,462,394 | 5.98 | 404 | 229 | 92,604 | 15.79 |
| Mineral | 70,881 | 2,439 | 58 | 73,378 | 3.99 | 32 | 232 | 7,409 | 9.90 |
| Mingo | 5,165,408 | 339,038 | 104,099 | 5,608,545 | 5.05 | 1,458 | 239 | 338,606 | 16.56 |
| Monongalia | 8,356,735 | 141,098 | | 8,527,833 | 4.86 | 1,341 | 201 | 300,570 | 21.83 |
| Nicholas | 7,798,672 | 54,937 | 2,809 | 7,856,418 | 4.81 | 2,285 | 243 | 555,601 | 14.14 |
| Ohio | W | W | W | W | W | W | W | W | W |
| Pocahontas | W | W | W | W | W | W | W | W | W |
| Preston | 2,992,619 | 841,525 | 102 | 3,834,306 | 3.70 | 1,358 | 231 | 313,657 | 11.27 |
| Putnam | | 4,880 | | 4,880 | 4.56 | 3 | 190 | 569 | 8.58 |
| Raleigh | 7,413,773 | 210,770 | 32,776 | 7,657,319 | 5.59 | 2,892 | 228 | 659,179 | 11.62 |
| Randolph | 998,389 | 102,678 | | 1,051,067 | 3.69 | 649 | 207 | 134,578 | 7.81 |
| Taylor | 425,290 | 4,460 | 10 | 429,750 | 3.22 | 152 | 143 | 21,687 | 19.82 |
| Tucker | 245,276 | | | 245,276 | 3.44 | 48 | 223 | 10,716 | 22.89 |
| Upshur | 407,672 | 14,440 | 48 | 422,160 | 4.01 | 215 | 133 | 28,653 | 14.73 |
| Wayne | 18,025 | 12,364 | | 30,389 | 4.56 | 76 | 100 | 7,597 | 4.00 |
| Webster | 808,355 | 13,251 | 3,658 | 825,264 | 4.24 | 370 | 196 | 72,464 | 11.39 |
| Wyoming | 13,278,310 | 175,617 | 26,060 | 13,479,987 | 5.40 | 4,406 | 244 | 1,077,115 | 12.51 |
| Other counties | 4,330,614 | 134,060 | 2,021,683 | 6,486,357 | 4.48 | 1,735 | 228 | 400,769 | 16.18 |
| Total West Virginia | 134,929,125 | 3,579,536 | 2,899,837 | 141,408,498 | 4.90 | 30,308 | 235 | 9,234,723 | 15.31 |

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WYOMING

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Campbell | 468,544 | 20,302 | ---------- | 488,846 | 1.35 | 34 | 261 | 8,888 | 55.00 |
| Carbon | 446,504 | ---------- | 5 | 446,509 | 3.85 | 77 | 145 | 11,163 | 40.00 |
| Converse | W | W | W | W | W | W | W | W | W |
| Hot Springs | 3,946 | 7,842 | ---------- | 11,788 | 8.29 | 16 | 147 | 2,358 | 5.00 |
| Lincoln | W | W | W | W | W | W | W | W | W |
| Sheridan | 412,761 | 18,760 | ---------- | 431,521 | 3.32 | 38 | 252 | 9,589 | 45.00 |
| Sweetwater | W | W | W | W | W | W | W | W | W |
| Other counties | 259,921 | 1,009,488 | 453,241 | 1,722,650 | 3.40 | 236 | 153 | 36,156 | 47.64 |
| Total Wyoming | 1,591,676 | 1,056,392 | 453,246 | 3,101,314 | 3.15 | 401 | 170 | 68,154 | 45.50 |

UNITED STATES

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Total United States | 408,725,328 | 65,532,391 | 12,740,233 | 486,997,952 | 4.45 | 128,698 | 225 | 28,917,328 | 16.84 |

W Withheld to avoid disclosing individual company data; included with "other counties."

[1] Includes coal loaded at mine directly into railroad cars or river barges, hauled by trucks to railroad sidings, and hauled by trucks to waterways.

[2] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.

[3] Value received or charged for coal f.o.b. mine. Includes a value for coal not sold but used by producers, such as mine fuel and coal coked, as estimated by producers at average prices that might have been received if such coal had been sold commercially.

[4] In certain counties the average tons per man per day is large because of auger mining, strip mining, or mechanical loading underground.

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## TRANSPORTATION

Within recent years, methods of shipping bituminous coal and lignite from the mines have changed radically; shipments by rail have declined, and shipments by water and truck have increased. Usually, shipments by water or truck (particularly for short distances) cost less than rail freight rates. See figure 13.

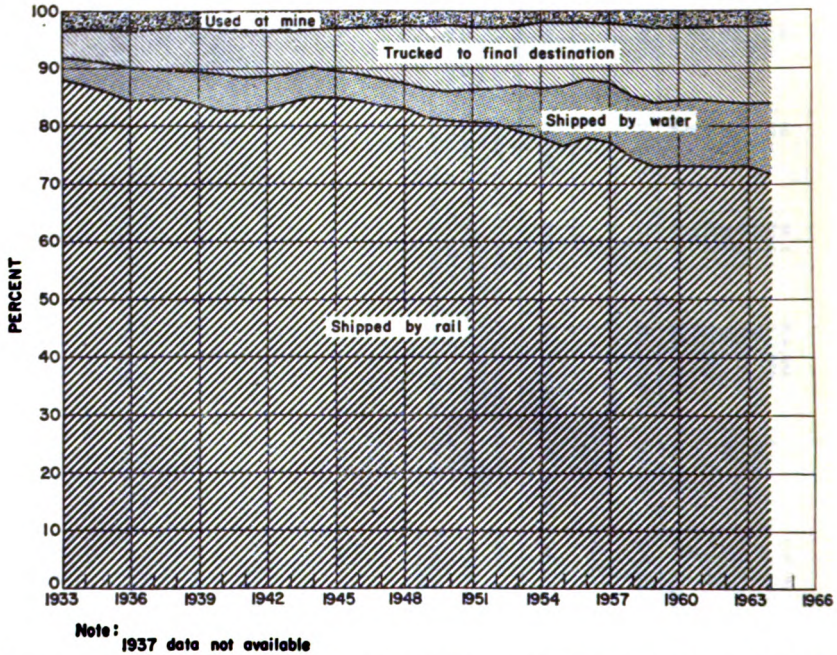


FIGURE 13.—Percentage of total production of bituminous coal and lignite, 1933–64, by method of shipment from mines, and percentage used at mines.

**TABLE 61.—Bituminous coal and lignite shipped from mines, by method of shipment, and that used at mines in the United States**

| Year | Method of shipment from mines | | | Used at mine [1] | Total production |
|---|---|---|---|---|---|
| | Shipped by rail and trucked to rail | Shipped by water and trucked to water | Trucked to final destination | | |
| | THOUSAND NET TONS | | | | |
| 1933 | 293,258 | 13,021 | 15,463 | 11,888 | 333,630 |
| 1934 | 313,304 | 15,128 | 18,739 | 12,197 | 359,368 |
| 1935 | 319,742 | 18,327 | 21,960 | 12,344 | 372,373 |
| 1936 | 370,763 | 24,868 | 27,929 | 15,528 | 439,088 |
| 1937 | NA | NA | NA | NA | 445,531 |
| 1938 | 295,336 | 16,903 | 25,592 | 10,714 | 348,545 |
| 1939 | 331,190 | 22,229 | 29,534 | 11,902 | 394,855 |
| 1940 | 380,388 | 29,493 | 35,540 | 15,350 | 460,771 |
| 1941 | 425,184 | 30,240 | 40,056 | 18,669 | 514,149 |
| 1942 | 482,814 | 34,018 | 45,154 | 20,707 | 582,693 |
| 1943 | 495,863 | 30,188 | 42,433 | 21,693 | 590,177 |
| 1944 | 527,136 | 31,518 | 40,123 | 20,799 | 619,576 |
| 1945 | 490,472 | 27,548 | 41,477 | 18,120 | 577,617 |

See footnotes at end of table.

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**TABLE 61.—Bituminous coal and lignite shipped from mines, by method of shipment, and that used at mines in the United States—Continued**

| Year | Method of shipment from mines | | | Used at mine [1] | Total production |
|---|---|---|---|---|---|
| | Shipped by rail and trucked to rail | Shipped by water and trucked to water | Trucked to final destination | | |
| | THOUSAND NET TONS | | | | |
| 1946 | 450,615 | 24,642 | 42,731 | 15,934 | 533,922 |
| 1947 | 527,282 | 29,808 | 55,859 | 17,680 | 630,624 |
| 1948 | 498,194 | 26,735 | 58,260 | 16,329 | 599,518 |
| 1949 | 356,602 | 21,829 | 47,786 | 11,051 | 437,868 |
| 1950 | 417,225 | 27,583 | 58,286 | 13,217 | 516,311 |
| 1951 | 430,387 | 29,984 | 58,132 | 15,162 | 533,665 |
| 1952 | 375,911 | 27,746 | 50,231 | 12,953 | 466,841 |
| 1953 | 362,133 | 35,648 | 47,102 | 12,407 | 457,290 |
| 1954 | 305,918 | 32,912 | 44,089 | 8,187 | 391,706 |
| 1955 | 355,924 | 47,476 | 51,607 | 9,626 | 464,633 |
| 1956 | 390,015 | 50,732 | 49,768 | 10,359 | 500,874 |
| 1957 | 380,471 | 51,171 | 50,334 | 10,728 | 492,704 |
| 1958 | 305,642 | 43,899 | 50,605 | 10,300 | 410,446 |
| 1959 | 300,763 | 45,954 | 52,564 | 12,747 | 412,028 |
| 1960 | 308,865 | 46,784 | 52,899 | 12,164 | 415,512 |
| 1961 | 293,546 | 46,348 | 51,044 | 12,039 | 402,977 |
| 1962 | 307,328 | 48,106 | 54,853 | 11,862 | 422,149 |
| 1963 | 333,989 | 50,664 | 60,901 | 13,374 | 458,928 |
| 1964 | 349,377 | 59,349 | 65,532 | 12,740 | 486,998 |
| | PERCENTAGE OF TOTAL | | | | |
| 1933 | 87.9 | 3.9 | 4.6 | 3.6 | 100.0 |
| 1934 | 87.2 | 4.2 | 5.2 | 3.4 | 100.0 |
| 1935 | 85.9 | 4.9 | 5.9 | 3.3 | 100.0 |
| 1936 | 84.4 | 5.7 | 6.4 | 3.5 | 100.0 |
| 1937 | NA | NA | NA | NA | 100.0 |
| 1938 | 84.7 | 4.9 | 7.3 | 3.1 | 100.0 |
| 1939 | 83.9 | 5.6 | 7.5 | 3.0 | 100.0 |
| 1940 | 82.6 | 6.4 | 7.7 | 3.3 | 100.0 |
| 1941 | 82.7 | 5.9 | 7.8 | 3.6 | 100.0 |
| 1942 | 82.9 | 5.8 | 7.7 | 3.6 | 100.0 |
| 1943 | 84.0 | 5.1 | 7.2 | 3.7 | 100.0 |
| 1944 | 85.1 | 5.1 | 6.5 | 3.3 | 100.0 |
| 1945 | 84.9 | 4.8 | 7.2 | 3.1 | 100.0 |
| 1946 | 84.4 | 4.6 | 8.0 | 3.0 | 100.0 |
| 1947 | 83.6 | 4.7 | 8.9 | 2.8 | 100.0 |
| 1948 | 83.1 | 4.5 | 9.7 | 2.7 | 100.0 |
| 1949 | 81.4 | 5.0 | 10.9 | 2.7 | 100.0 |
| 1950 | 80.8 | 5.3 | 11.3 | 2.6 | 100.0 |
| 1951 | 80.7 | 5.6 | 10.9 | 2.8 | 100.0 |
| 1952 | 80.5 | 5.9 | 10.8 | 2.8 | 100.0 |
| 1953 | 79.2 | 7.8 | 10.3 | 2.7 | 100.0 |
| 1954 | 78.1 | 8.4 | 11.4 | 2.1 | 100.0 |
| 1955 | 76.6 | 10.2 | 11.1 | 2.1 | 100.0 |
| 1956 | 77.9 | 10.1 | 9.9 | 2.1 | 100.0 |
| 1957 | 77.2 | 10.4 | 10.2 | 2.2 | 100.0 |
| 1958 | 74.5 | 10.7 | 12.3 | 2.5 | 100.0 |
| 1959 | 73.0 | 11.1 | 12.8 | 3.1 | 100.0 |
| 1960 | 73.1 | 11.3 | 12.7 | 2.9 | 100.0 |
| 1961 | 72.9 | 11.5 | 12.6 | 3.0 | 100.0 |
| 1962 | 72.8 | 11.4 | 13.0 | 2.8 | 100.0 |
| 1963 | 72.8 | 11.0 | 13.3 | 2.9 | 100.0 |
| 1964 | 71.7 | 12.2 | 13.5 | 2.6 | 100.0 |

NA Not available.

[1] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.

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**TABLE 62.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States, 1964, as reported by mine operators**

| Route | State | By State (net tons) | Total for route (net tons) |
|---|---|---|---|
| RAILROAD | | | |
| Alaska | Alaska | 725,862 | 725,862 |
| Atchison, Topeka & Santa Fe | Colorado | 14,777 | 1,051,341 |
| | Illinois | 204,289 | |
| | New Mexico | 832,275 | |
| Baltimore & Ohio | Illinois | 400,038 | 37,150,433 |
| | Ohio | 4,397,844 | |
| | Pennsylvania | 3,771,558 | |
| | West Virginia | 28,580,993 | |
| Bessemer & Lake Erie | Pennsylvania | 1,413,542 | 1,413,542 |
| Cambria & Indiana | do | 2,677,606 | 2,677,606 |
| Carbon County | Utah | 1,187,394 | 1,187,394 |
| Chesapeake & Ohio | Kentucky | 11,067,754 | 47,883,912 |
| | Ohio | 21,913 | |
| | Virginia | 171,159 | |
| | West Virginia | 36,623,086 | |
| Cheswick & Harmar | Pennsylvania | 410,520 | 410,520 |
| Chicago, Burlington & Quincy | Illinois | 8,230,476 | 9,916,511 |
| | Iowa | 281,818 | |
| | Missouri | 518,966 | |
| | Wyoming | 885,251 | |
| Chicago & Eastern Illinois | Illinois | 2,244,950 | 2,699,766 |
| | Indiana | 454,816 | |
| Chicago & Illinois Midland | Illinois | 5,284,978 | 5,284,978 |
| Chicago, Milwaukee, St. Paul & Pacific | Indiana | 1,936,995 | 2,084,488 |
| | North Dakota (lignite) | 147,493 | |
| Chicago & North Western | Illinois | 2,000,636 | 2,000,636 |
| Chicago, Rock Island & Pacific | do | 1,146,928 | 1,459,525 |
| | Iowa | 309,097 | |
| | Missouri | 3,500 | |
| Clinchfield | Kentucky | 210,696 | 3,480,890 |
| | Virginia | 3,270,194 | |
| Colorado & Wyoming | Colorado | 776,281 | 776,281 |
| Denver & Rio Grande Western | do | 2,081,317 | 4,446,837 |
| | New Mexico | 2,763 | |
| | Utah | 2,362,757 | |
| Erie-Lackawanna | Ohio | 235,887 | 284,433 |
| | Pennsylvania | 48,546 | |
| Great Northern | North Dakota (lignite) | 450,146 | 450,146 |
| Gulf, Mobile & Ohio | Illinois | 1,603,962 | 1,603,962 |
| Illinois Central | do | 13,277,800 | 25,745,717 |
| | Indiana | 33,798 | |
| | Kentucky | 12,434,119 | |
| Illinois Terminal | Illinois | 295,443 | 295,443 |
| Interstate | Virginia | 3,604,410 | 3,604,410 |
| Kansas City Southern | Oklahoma | 153,826 | 153,826 |
| Kentucky & Tennessee | Kentucky | 403,317 | 403,317 |
| Lake Erie, Franklin & Clarion | Pennsylvania | 379,133 | 379,133 |
| Louisville & Nashville | Alabama | 1,898,106 | 25,564,382 |
| | Kentucky | 23,037,992 | |
| | Tennessee | 628,284 | |
| Mary Lee | Alabama | 887,261 | 887,261 |
| Midland Valley | Oklahoma | 273,718 | 273,718 |
| Missouri-Illinois | Illinois | 741,377 | 741,377 |
| Missouri-Kansas-Texas | Kansas | 630,320 | 1,371,969 |
| | Missouri | 728,346 | |
| | Oklahoma | 13,303 | |
| Missouri Pacific | Arkansas | 201,692 | 4,656,129 |
| | Illinois | 4,286,534 | |
| | Missouri | 48,015 | |
| | Oklahoma | 119,888 | |
| Monon | Indiana | 210,649 | 210,649 |
| Monongahela | Pennsylvania | 938,562 | 7,387,384 |
| | West Virginia | 6,448,822 | |
| Montour | Pennsylvania | 1,524,054 | 1,524,054 |
| New York Central (includes coal shipped over Kanawha & Michigan, Kelley's Creek, Toledo & Ohio Central, and Zanesville & Western). | Illinois | 5,686,807 | 24,393,383 |
| | Indiana | 5,904,662 | |
| | Ohio | 3,061,469 | |
| | Pennsylvania | 5,003,889 | |
| | West Virginia | 4,736,556 | |
| New York, Chicago & St. Louis | Ohio | 5,172,858 | 5,172,858 |
| Norfolk & Western | Kentucky | 5,491,449 | 67,157,102 |
| | Ohio | 799,500 | |
| | Virginia | 19,856,006 | |
| | West Virginia | 41,010,147 | |
| Northern Pacific | Montana (bit. & lig.) | 297,242 | 1,449,835 |
| | North Dakota (lignite) | 1,152,593 | |

See footnotes at end of table.

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**TABLE 62.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States, 1964, as reported by mine operators—Continued**

| Route | State | By State (net tons) | Total for route (net tons) |
|---|---|---|---|
| RAILROAD—continued | | | |
| Pacific Coast | Washington | 18,696 | 18,696 |
| Pennsylvania | Indiana | 677,393 | 26,016,556 |
| | Ohio | 4,081,534 | |
| | Pennsylvania | 21,237,129 | |
| | West Virginia | 20,500 | |
| Pittsburg & Shawmut | Pennsylvania | 2,053,208 | 2,053,208 |
| Pittsburgh & Lake Erie | do | 1,167,730 | 1,167,730 |
| Pittsburgh & West Virginia | Ohio | 945,554 | 945,554 |
| St. Louis-San Francisco | Alabama | 529,047 | 1,304,858 |
| | Arkansas | 8,643 | |
| | Kansas | 329,912 | |
| | Oklahoma | 437,256 | |
| Soo Line | North Dakota (lignite) | 263,066 | 263,066 |
| Southern | Alabama | 3,058,555 | 6,038,926 |
| | Indiana | 97,706 | |
| | Kentucky | 728,931 | |
| | Tennessee | 1,723,136 | |
| | Virginia | 430,598 | |
| Southern Iowa | Iowa | 8,510 | 8,510 |
| Tennessee | Tennessee | 765,206 | 765,206 |
| Tennessee Central | do | 527,162 | 527,162 |
| Tennessee Coal, Iron and Railroad Co | Alabama | 2,213,023 | 2,213,023 |
| Toledo, Peoria & Western | Illinois | 543,202 | 543,202 |
| Union Pacific | Colorado | 517,019 | 1,223,444 |
| | Wyoming | 706,425 | |
| Utah | Utah | 657,332 | 657,332 |
| Wabash | Iowa | 65,041 | 543,326 |
| | Missouri | 478,285 | |
| Western Allegheny | Pennsylvania | 83,519 | 83,519 |
| Western Maryland | Maryland | 619,573 | 5,473,679 |
| | Pennsylvania | 204,118 | |
| | West Virginia | 4,649,988 | |
| Woodward Iron Company | Alabama | 1,106,552 | 1,106,552 |
| Youngstown & Southern | Ohio | 45,511 | 62,140 |
| | Pennsylvania | 16,629 | |
| Total railroad shipments | | 349,376,699 | 349,376,699 |
| WATERWAY | | | |
| Allegheny River | Pennsylvania | 1,609,345 | 1,609,345 |
| Black Warrior River | Alabama | 2,102,503 | 2,102,503 |
| Conemaugh River | Pennsylvania | 223,746 | 223,746 |
| Green River | Kentucky | 10,354,576 | 10,354,576 |
| Guyandot River | West Virginia | 14,363 | 14,363 |
| Illinois River | Illinois | 3,245,151 | 3,245,151 |
| Kanawha River | West Virginia | 5,350,062 | 5,350,062 |
| Kentucky River | Kentucky | 4,707 | 4,707 |
| Monongahela River | Pennsylvania | 17,871,508 | 24,417,052 |
| | West Virginia | 6,545,544 | |
| Ohio River | Illinois | 447,392 | 11,479,862 |
| | Indiana | 1,793,774 | |
| | Kentucky | 4,444,264 | |
| | Ohio | 3,845,368 | |
| | West Virginia | 949,064 | |
| Tennessee River | Alabama | 88,454 | 547,262 |
| | Tennessee | 458,808 | |
| Total waterway shipments | | 59,348,629 | 59,348,629 |
| Total loaded at mines for shipment by railroads and waterways | | 408,725,328 | 408,725,328 |
| Shipped by truck from mine to final destination | | 65,532,391 | 65,532,391 |
| Used at mine [1] | | 12,740,233 | 12,740,233 |
| Total production, 1964 | | 486,997,952 | 486,997,952 |

[1] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.

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## CONSUMPTION

The statistics on consumption of bituminous coal and lignite, by major consumer classes, are based upon complete coverage of all consumers in each class except "Other manufacturing and mining industries" and "Retail deliveries to other consumers." The figures for both categories are based upon a monthly sample approximating 35 percent coverage. A new benchmark representing complete coverage for "Other manufacturing and mining industries" was established for 1954, based upon data from the Census of Manufactures and the Census of Mineral Industries. The new benchmark for "Retail deliveries to other consumers" for 1954 represents the residual tonnage not otherwise accounted for, and includes some coal shipped by truck from mine to final destination.

Data for each month are determined by matching plants reporting for the latest month with identical plants reporting the preceding month, calculating the percentage change from the previous month,

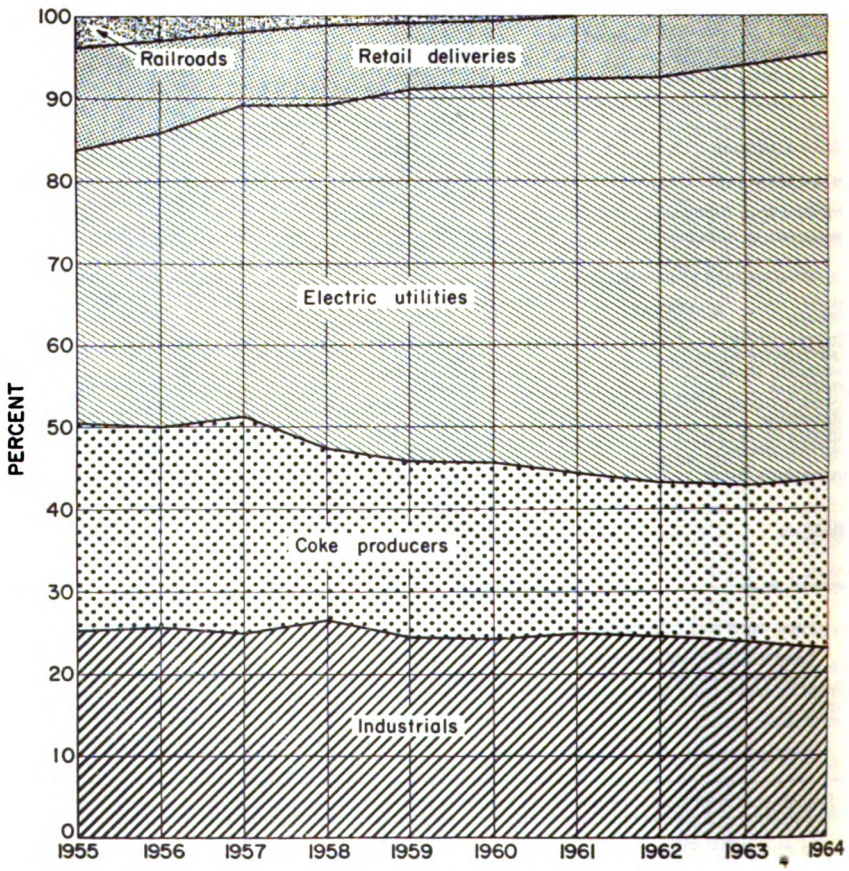


FIGURE 14.—Percentage of total consumption of bituminous coal and lignite, by consumer class, and retail deliveries in the United States, 1955–64

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and applying this percentage change to the published figure for the previous month. The results have been reasonably reliable over a period of years. A detailed analysis of the establishment of the new benchmarks and the revisions in "Cement mills," "Steel and rolling mills," and "Bunker, foreign, and lake vessels," is given in Bureau of Mines Weekly Coal Report 2113, March 14, 1958. The total of the classes approximates total consumption and is a much more reliable figure than calculated consumption based on production, imports, exports, and changes in stocks, because certain significant items of stocks are not included in yearend stocks. See figure 14.

**TABLE 63.—Consumption of bituminous coal and lignite, by consumer class, with retail deliveries in the United States**

(Thousand net tons)

| Year and month | Electric power utilities [1] | Bunker, lake vessel and foreign [2] | Railroads (class I) [3] | Manufacturing and mining industries | | | | | Retail deliveries to other consumers [6] | Total of classes shown [7] |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Beehive coke plants | Oven coke plants | Steel and rolling mills [4] | Cement mills | Other manufacturing and mining industries [5] | | |
| 1933 | 27,088 | 2,298 | 72,548 | 1,408 | 38,681 | 14,129 | 2,760 | 81,377 | 77,396 | 317,685 |
| 1934 | 29,707 | 2,423 | 76,037 | 1,635 | 44,343 | 15,391 | 3,457 | 87,314 | 83,507 | 343,814 |
| 1935 | 30,936 | 2,683 | 77,109 | 1,469 | 49,046 | 16,585 | 3,456 | 94,598 | 80,444 | 356,326 |
| 1936 | 38,104 | 3,052 | 86,391 | 2,698 | 63,244 | 19,019 | 4,711 | 111,030 | 80,044 | 408,293 |
| 1937 | 41,045 | 3,433 | 88,080 | 4,927 | 69,575 | 18,148 | 5,182 | 124,056 | 76,331 | 430,777 |
| 1938 | 36,440 | 2,310 | 73,921 | 1,360 | 45,266 | 11,877 | 4,413 | 94,196 | 66,498 | 336,281 |
| 1939 | 42,304 | 2,764 | 79,072 | 2,298 | 61,216 | 13,843 | 5,194 | 100,637 | 68,770 | 376,098 |
| 1940 | 49,126 | 2,989 | 85,130 | 4,803 | 76,583 | 14,169 | 5,559 | 107,864 | 84,687 | 430,910 |
| 1941 | 59,888 | 3,304 | 97,384 | 10,529 | 82,609 | 15,384 | 6,735 | 121,880 | 94,402 | 492,115 |
| 1942 | 63,472 | 3,226 | 115,410 | 12,876 | 87,974 | 14,722 | 7,462 | 132,767 | 102,141 | 540,050 |
| 1943 | 74,036 | 3,042 | 130,283 | 12,441 | 90,019 | 15,864 | 5,842 | 142,149 | 120,121 | 593,797 |
| 1944 | 76,656 | 3,069 | 132,049 | 10,858 | 94,438 | 15,152 | 3,767 | 131,498 | 122,112 | 589,599 |
| 1945 | 71,603 | 3,192 | 125,120 | 8,135 | 87,214 | 14,241 | 4,203 | 126,562 | 119,297 | 559,567 |
| 1946 | 68,743 | 2,632 | 110,166 | 7,167 | 76,121 | 12,151 | 6,990 | 117,732 | 98,684 | 500,386 |
| 1947 | 86,009 | 3,087 | 109,296 | 10,475 | 94,325 | 14,195 | 7,919 | 123,928 | 96,657 | 545,891 |
| 1948 | 95,620 | 2,552 | 94,838 | 10,322 | 96,984 | 14,193 | 8,546 | 110,060 | 86,794 | 519,909 |
| 1949 | 80,610 | 2,056 | 68,123 | 5,354 | 85,882 | 10,529 | 7,966 | 96,629 | 88,389 | 445,538 |
| 1950 | 88,262 | 2,042 | 60,969 | 9,088 | 94,757 | 10,877 | 7,923 | 95,862 | 84,422 | 454,202 |
| 1951 | 101,898 | 2,220 | 54,005 | 11,418 | 102,030 | 11,260 | 8,507 | 103,188 | 74,378 | 468,904 |
| 1952 | 103,309 | 1,839 | 37,962 | 6,912 | 90,702 | 9,632 | 7,903 | 93,637 | 66,861 | 418,757 |
| 1953 | 112,283 | 1,839 | 27,735 | 8,226 | 104,648 | 8,764 | 8,167 | 95,160 | 59,976 | 426,798 |
| 1954 | 115,235 | 1,244 | 17,370 | 980 | 84,411 | 6,983 | 7,924 | 77,115 | 51,798 | 363,060 |
| 1955 | 140,550 | 1,499 | 15,473 | 2,869 | 104,508 | 7,353 | 8,529 | 89,611 | 53,020 | 423,412 |
| 1956 | 154,983 | 1,470 | 12,308 | 4,043 | 101,870 | 7,189 | 9,026 | 93,302 | 48,667 | 432,858 |
| 1957 | 157,398 | 1,364 | 8,401 | 3,473 | 104,547 | 6,938 | 8,633 | 87,202 | 35,712 | 413,668 |
| 1958 | 152,928 | 955 | 3,725 | 1,017 | 75,563 | 7,268 | 8,256 | 81,372 | 35,619 | 366,703 |
| 1959 | 165,788 | 969 | 2,600 | 1,827 | 77,354 | 6,674 | 8,510 | 73,396 | 29,138 | 366,256 |
| 1960 | 173,882 | 945 | 2,101 | 1,640 | 79,375 | 7,378 | 8,216 | 76,487 | 30,405 | 380,429 |
| 1961 | 179,629 | 770 | (8) | 1,496 | 72,385 | 7,495 | 7,615 | 77,280 | 27,735 | 374,405 |
| 1962 | 190,833 | 687 | (8) | 1,339 | 72,923 | 7,319 | 7,719 | 78,766 | 28,188 | 387,774 |
| 1963: | | | | | | | | | | |
| January | 19,684 | 1 | (8) | 110 | 6,029 | 848 | 579 | 7,911 | 4,710 | 39,872 |
| February | 17,624 | ------- | (8) | 112 | 5,637 | 786 | 616 | 7,254 | 3,928 | 35,857 |
| March | 17,073 | 1 | (8) | 110 | 6,603 | 743 | 599 | 7,435 | 2,302 | 34,866 |
| April | 15,378 | 34 | (8) | 144 | 6,763 | 605 | 617 | 6,729 | 1,011 | 31,281 |
| May | 15,717 | 99 | (8) | 168 | 7,139 | 574 | 711 | 6,635 | 830 | 31,873 |
| June | 16,191 | 81 | (8) | 160 | 6,771 | 511 | 750 | 6,217 | 703 | 31,384 |
| July | 17,053 | 72 | (8) | 142 | 6,398 | 469 | 735 | 5,900 | 841 | 31,610 |
| August | 17,649 | 85 | (8) | 134 | 5,976 | 447 | 740 | 6,284 | 1,153 | 32,468 |
| September | 16,566 | 89 | (8) | 134 | 5,905 | 479 | 716 | 6,171 | 1,536 | 31,596 |
| October | 17,593 | 98 | (8) | 139 | 6,233 | 518 | 701 | 7,023 | 1,511 | 33,816 |
| November | 17,783 | 85 | (8) | 128 | 6,108 | 597 | 719 | 7,058 | 1,905 | 34,383 |
| December | 20,727 | 25 | (8) | 132 | 6,458 | 824 | 755 | 8,180 | 3,118 | 40,219 |
| Total | 209,038 | 670 | (8) | 1,613 | 76,020 | 7,401 | 8,138 | 82,797 | 23,548 | 409,225 |

See footnotes at end of table.

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**TABLE 63.—Consumption of bituminous coal and lignite, by consumer class, with retail deliveries in the United States—Continued**

(Thousand net tons)

| Year and month | Electric power utilities [1] | Bunker, lake vessel and foreign [2] | Railroads (class I) [3] | Manufacturing and mining industries | | | | | Retail deliveries to other consumers [6] | Total of classes shown [7] |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Beehive coke plants | Oven coke plants | Steel and rolling mills [4] | Cement mills | Other manufacturing and mining industries [5] | | |
| 1964: | | | | | | | | | | |
| January | 20,389 | 1 | (8) | 140 | 6,657 | 817 | 617 | 8,188 | 2,968 | 39,777 |
| February | 18,732 | 1 | (8) | 135 | 6,412 | 776 | 619 | 7,590 | 2,496 | 36,761 |
| March | 18,465 | 5 | (8) | 154 | 6,868 | 764 | 683 | 7,636 | 1,872 | 36,447 |
| April | 16,666 | 56 | (8) | 151 | 6,901 | 654 | 686 | 6,918 | 1,030 | 33,062 |
| May | 16,757 | 103 | (8) | 155 | 7,389 | 542 | 726 | 6,517 | 518 | 32,707 |
| June | 17,997 | 91 | (8) | 133 | 7,221 | 488 | 721 | 6,009 | 562 | 33,222 |
| July | 18,794 | 79 | (8) | 114 | 7,337 | 474 | 758 | 5,558 | 655 | 33,769 |
| August | 18,685 | 88 | (8) | 156 | 7,308 | 462 | 775 | 6,080 | 1,066 | 34,620 |
| September | 18,013 | 92 | (8) | 182 | 7,311 | 479 | 732 | 6,171 | 1,501 | 34,481 |
| October | 18,682 | 94 | (8) | 210 | 7,777 | 567 | 766 | 7,152 | 2,190 | 37,438 |
| November | 18,678 | 80 | (8) | 233 | 7,646 | 623 | 782 | 7,080 | 1,851 | 36,973 |
| December | 21,174 | 21 | (8) | 262 | 7,905 | 748 | 814 | 8,029 | 2,906 | 41,859 |
| Total | 223,032 | 711 | (8) | 2,025 | 86,732 | 7,394 | 8,679 | 82,928 | 19,615 | 431,116 |

[1] Federal Power Commission.
[2] Bureau of the Census, U.S. Department of Commerce, Ore and Coal Exchange.
[3] Association of American Railroads. Represents consumption of bituminous coal and lignite for all uses, including locomotive, powerhouse, shop, and station fuel.
[4] Estimates based upon reports collected from a selected list of representative steel and rolling mills.
[5] Estimates based upon reports collected from a selected list of representative manufacturing plants.
[6] Estimates based upon reports collected from a selected list of representative retailers. Includes some coal shipped by truck from mine to final destination.
[7] The total classes shown approximates total consumption. The calculation of consumption from production, imports, exports, and changes in stocks is not as accurate as the "Total of classes shown" because certain significant items of stocks are not included in year-end stocks. These items are: Stocks on Lake and Tidewater docks, stocks at other intermediate storage piles between mine and consumer, and coal in transit.
[8] Canvass discontinued.

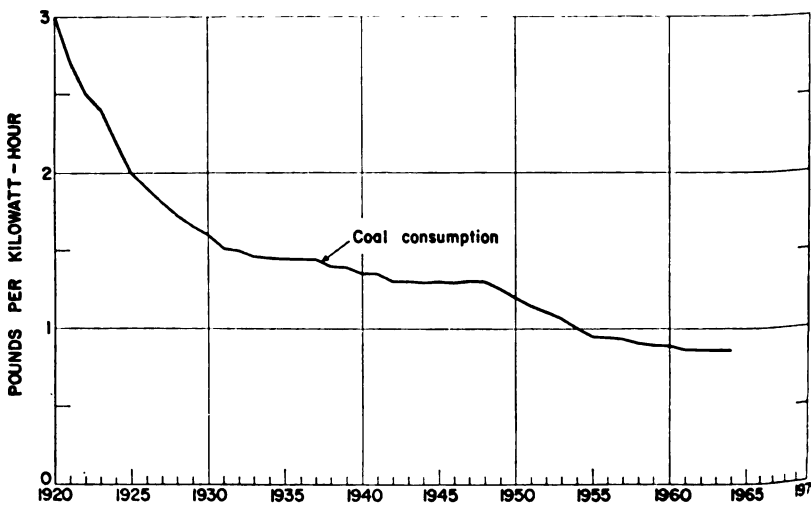


FIGURE 15.—Trend in fuel economy at electric-utility powerplants in the United States, 1920–64.

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**TABLE 64.—Fuel economy in consumption of coal at electric-utility powerplants in the United States**

| Year | Coal consumed per kilowatt-hour (pounds) | Index numbers based on 1919 as 100 | Year | Coal consumed per kilowatt-hour (pounds) | Index numbers based on 1919 as 100 | Year | Coal consumed per kilowatt-hour (pounds) | Index numbers based on 1919 as 100 |
|---|---|---|---|---|---|---|---|---|
| 1919 | 3.20 | 100.0 | 1935 | 1.44 | 45.0 | 1951 | 1.14 | 35.6 |
| 1920 | 3.00 | 93.8 | 1936 | 1.44 | 45.0 | 1952 | 1.10 | 34.4 |
| 1921 | 2.70 | 84.4 | 1937 | 1.44 | 45.0 | 1953 | 1.06 | 33.1 |
| 1922 | 2.50 | 78.1 | 1938 | 1.40 | 43.8 | 1954 | .99 | 30.9 |
| 1923 | 2.40 | 75.0 | 1939 | 1.38 | 43.1 | 1955 | .95 | 29.7 |
| 1924 | 2.20 | 68.8 | 1940 | 1.34 | 41.9 | 1956 | .94 | 29.4 |
| 1925 | 2.00 | 62.5 | 1941 | 1.34 | 41.9 | 1957 | .93 | 29.1 |
| 1926 | 1.90 | 59.4 | 1942 | 1.30 | 40.6 | 1958 | .90 | 28.1 |
| 1927 | 1.82 | 56.9 | 1943 | 1.30 | 40.6 | 1959 | .89 | 27.8 |
| 1928 | 1.73 | 54.1 | 1944 | 1.29 | 40.3 | 1960 | .88 | 27.5 |
| 1929 | 1.66 | 51.9 | 1945 | 1.30 | 40.6 | 1961 | .86 | 26.9 |
| 1930 | 1.60 | 50.0 | 1946 | 1.29 | 40.3 | 1962 | .86 | 26.9 |
| 1931 | 1.52 | 47.5 | 1947 | 1.31 | 40.9 | 1963 | .86 | 26.9 |
| 1932 | 1.49 | 46.6 | 1948 | 1.30 | 40.6 | 1964 | .86 | 26.9 |
| 1933 | 1.46 | 45.6 | 1949 | 1.24 | 38.8 | | | |
| 1934 | 1.45 | 45.3 | 1950 | 1.19 | 37.2 | | | |

## DISTRIBUTION OF BITUMINOUS COAL AND LIGNITE

Tables 65, 66, and 67 summarize the distribution of bituminous coal and lignite in 1964 for types of consumer use by methods of transportation, by coal-producing districts of origin, by geographic divisions, and by States of destination. This shows the participation of the bituminous coal and lignite industry in various energy markets of the Nation, both locally and nationally, and also provides benchmarks for special studies and analyses of the many factors that influence coal production and its utilization in the highly competitive energy market.

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**TABLE 65.—Distribution of bituminous coal and lignite, 1964, by method of movement and consumer use**

(Thousand net tons)

| Shipments | Electric utilities | Coke and gas plants | Retail dealers | All others | Railroad fuel | Used at mines and sales to employees |
|---|---|---|---|---|---|---|
| Total shipments to all destinations in the United States, Canada, and Mexico, by all methods of movements and consumer use, and overseas exports | 229,392 | 95,631 | 22,911 | 100,249 | 1,437 | 1,956 |
| Shipments to all destinations in the United States, Canada, and Mexico by specific method of movement and consumer use: | | | | | | |
| Method of movement: | | | | | | |
| All-rail | 112,646 | 44,627 | 14,903 | 62,240 | ------ | ------ |
| River and ex-river | 50,598 | 28,301 | 762 | 6,378 | ------ | ------ |
| Great Lakes [1] | 20,209 | 15,066 | 3,265 | 12,842 | ------ | ------ |
| Tidewater [2] | 15,577 | 6,209 | 101 | 1,886 | ------ | ------ |
| Truck | 18,958 | 957 | 3,880 | 16,758 | ------ | ------ |
| Tramway, conveyor, and private railroad | 11,404 | 471 | ------ | 145 | ------ | ------ |
| Method of movement and/or consumer uses unknown | ------ | ------ | ------ | ------ | 1,437 | 1,956 |
| Total | 229,392 | 95,631 | 22,911 | 100,249 | 1,437 | 1,956 |

| | Canadian Great Lakes commercial docks [3] | U.S. Great Lakes dock storage [3] | U.S. tidewater dock storage [3] | Overseas exports [4] | Net change in mine inventory | Total |
|---|---|---|---|---|---|---|
| Total shipments to all destinations in the United States, Canada, and Mexico, by all methods of movements and consumer use, and overseas exports | 836 | —327 | 9 | 33,733 | —362 | 485,465 |
| Shipments to all destinations in the United States, Canada, and Mexico by specific method of movement and consumer use: | | | | | | |
| Method of movement: | | | | | | |
| All-rail | ------ | ------ | ------ | ------ | ------ | 234,416 |
| River and ex-river | ------ | ------ | ------ | ------ | ------ | 86,039 |
| Great Lakes [1] | ------ | ------ | ------ | ------ | ------ | 51,382 |
| Tidewater [2] | ------ | ------ | ------ | ------ | ------ | 23,773 |
| Truck | ------ | ------ | ------ | ------ | ------ | 40,553 |
| Tramway, conveyor, and private railroad | ------ | ------ | ------ | ------ | ------ | 12,020 |
| Method of movement and/or consumer uses unknown | 836 | —327 | 9 | 33,733 | —362 | 37,282 |
| Total | 836 | —327 | 9 | 33,733 | —362 | 485,465 |

[1] Excludes shipments to Canadian Great Lakes commercial docks and U.S. dock storage for which consumer uses are not available; however, includes vessel fuel, the destinations of which are not available.
[2] Excludes overseas exports and U.S. tidewater dock storage for which consumer uses are not available, however, includes bunker fuel, the destinations of which are not available.
[3] Consumer use unknown.
[4] Excludes Canada; consumer use unknown.

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**TABLE 66.—Distribution of bituminous coal and lignite, 1964, by district of origin and consumer use**

(Thousand net tons)

| District of origin [1] | Electric utilities | Coke and gas plants | Retail dealers | All others | Railroad fuel | Used at mines and sales to employees |
|---|---|---|---|---|---|---|
| 1 | 22,790 | 3,518 | 493 | 8,139 | 186 | 610 |
| 2 | 9,424 | 25,176 | 605 | 7,633 | 16 | 33 |
| 3 and 6 | 28,879 | 8,684 | 731 | 8,108 | 101 | 18 |
| 4 | 23,659 | | 1,913 | 11,877 | 240 | 60 |
| 7 | 1,040 | 17,675 | 1,973 | 3,191 | 90 | 546 |
| 8 | 45,250 | 27,770 | 9,166 | 30,778 | 221 | 561 |
| 9 | 32,113 | 74 | 1,974 | 4,299 | 68 | 1 |
| 10 | 34,989 | 1,313 | 2,984 | 15,656 | 279 | 44 |
| 11 | 9,348 | | 667 | 5,045 | 128 | 15 |
| 12 | 747 | | 4 | 261 | | |
| 13 | 7,971 | 6,190 | 208 | 854 | 1 | 1 |
| 14 | | 611 | 2 | 64 | | |
| 15 [2] | 3,950 | 45 | 188 | 1,021 | 5 | |
| 16 | 535 | | 65 | 171 | | 6 |
| 17 | 1,113 | 2,251 | 345 | 268 | | 2 |
| 18 | 2,542 | | 11 | 48 | | |
| 19 | 2,234 | | 176 | 658 | 53 | 4 |
| 20 | 463 | 2,324 | 930 | 1,023 | 5 | 27 |
| 21 | 1,697 | | 389 | 645 | 39 | 22 |
| 22 and 23 | 648 | | 87 | 510 | 5 | 6 |
| Total | 229,392 | 95,631 | 22,911 | 100,249 | 1,437 | 1,956 |

| District of origin [1] | Canadian Great Lakes commercial docks [3] | U.S. Great Lakes dock storage [3] | U.S. tidewater dock storage [3] | Overseas exports [4] | Net change in mine inventory | Total |
|---|---|---|---|---|---|---|
| 1 | 19 | −18 | −2 | 1,773 | 57 | 37,565 |
| 2 | | 14 | | | −157 | 42,744 |
| 3 and 6 | 77 | 46 | 3 | 1,690 | 87 | 48,424 |
| 4 | 130 | −52 | | | −27 | 37,800 |
| 7 | 112 | −37 | 1 | 14,401 | −114 | 38,878 |
| 8 | 498 | −232 | 7 | 15,869 | −185 | 129,703 |
| 9 | | −5 | | | −138 | 38,386 |
| 10 | | −43 | | | −4 | 55,218 |
| 11 | | | | | 44 | 15,247 |
| 12 | | | | | | 1,012 |
| 13 | | | | | 104 | 15,329 |
| 14 | | | | | | 677 |
| 15 [2] | | | | | 9 | 5,218 |
| 16 | | | | | −3 | 774 |
| 17 | | | | | −1 | 3,978 |
| 18 | | | | | −15 | 2,586 |
| 19 | | | | | | 3,125 |
| 20 | | | | | −20 | 4,752 |
| 21 | | | | | 1 | 2,793 |
| 22 and 23 | | | | | | 1,256 |
| Total | 836 | −327 | 9 | 33,733 | −362 | 485,465 |

[1] Producing districts are defined in: Bureau of Mines. Bituminous Coal and Lignite Distribution Calendar Year 1964. Mineral Industry Survey, March, 1965, 21 pp.
[2] Excludes Texas.
[3] Consumer use unknown.
[4] Excludes Canada; consumer use unknown.

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**TABLE 67.—Distribution of bituminous coal and lignite, 1964, by destination and consumer use**

(Thousand net tons)

| Destination | Total | Electric utilities | Coke and gas plants | Retail dealers | All others |
|---|---|---|---|---|---|
| New England: | | | | | |
| Massachusetts | 4,160 | 3,426 | -------- | 160 | 574 |
| Connecticut | 4,767 | 3,985 | 476 | 26 | 280 |
| Maine, New Hampshire, Vermont, and Rhode Island | 1,080 | 789 | ---------- | 60 | 231 |
| Middle Atlantic: | | | | | |
| New York | 25,932 | 12,880 | 5,724 | 307 | 7,021 |
| New Jersey | 7,526 | 5,729 | 350 | 26 | 1,421 |
| Pennsylvania | 56,692 | 19,836 | 26,030 | 812 | 10,014 |
| East North Central: | | | | | |
| Ohio | 51,092 | 23,769 | 10,462 | 2,503 | 14,358 |
| Indiana | 35,885 | 17,019 | 11,856 | 1,361 | 5,649 |
| Illinois | 41,466 | 22,995 | 3,309 | 4,809 | 10,353 |
| Michigan | 30,936 | 14,690 | 5,309 | 1,771 | 9,166 |
| Wisconsin | 13,928 | 6,663 | 417 | 2,076 | 4,772 |
| West North Central: | | | | | |
| Minnesota | 7,077 | 3,849 | 1,031 | 581 | 1,616 |
| Iowa | 4,849 | 2,319 | ---------- | 548 | 1,982 |
| Missouri | 8,154 | 5,418 | 158 | 457 | 2,121 |
| North Dakota and South Dakota | 2,191 | 1,304 | ---------- | 481 | 406 |
| Nebraska and Kansas | 1,647 | 925 | ---------- | 112 | 610 |
| South Atlantic: | | | | | |
| Delaware and Maryland | 12,317 | 5,776 | 5,022 | 354 | 1,165 |
| District of Columbia | [2] 638 | 374 | ---------- | 136 | [2] 128 |
| Virginia | 13,787 | 7,824 | 126 | 1,078 | 4,759 |
| West Virginia | 18,205 | 7,627 | 5,096 | 258 | 5,224 |
| North Carolina | 11,595 | 8,487 | ---------- | 746 | 2,362 |
| South Carolina | 4,401 | 2,601 | ---------- | 302 | 1,498 |
| Georgia and Florida | 6,923 | 6,032 | ---------- | 285 | 606 |
| East South Central: | | | | | |
| Kentucky | 16,148 | 11,181 | 1,866 | 645 | 2,456 |
| Tennessee | 14,075 | 11,070 | 153 | 738 | 2,114 |
| Alabama and Mississippi | 19,626 | 12,000 | 6,458 | 166 | 1,002 |
| West South Central: | | | | | |
| Arkansas, Louisiana, Oklahoma, and Texas | 1,099 | 18 | 866 | 31 | 184 |
| Mountain: | | | | | |
| Colorado | 3,877 | 1,932 | 1,105 | 333 | 507 |
| Utah | 2,706 | 410 | 1,690 | 232 | 374 |
| Montana and Idaho | 1,190 | 294 | ---------- | 478 | 418 |
| Wyoming | 1,936 | 1,762 | ---------- | 50 | 124 |
| New Mexico | 2,169 | 2,116 | ---------- | 18 | 35 |
| Arizona and Nevada | 577 | 456 | ---------- | 54 | 67 |
| Pacific: | | | | | |
| Washington and Oregon | 774 | ---------- | ---------- | 278 | 496 |
| California | 2,015 | ---------- | 1,976 | 8 | 31 |
| Alaska | 842 | 354 | ---------- | 44 | 444 |
| Canada [3] | 13,228 | 3,175 | 5,547 | 552 | 3,954 |
| Mexico | 54 | ---------- | ---------- | ---------- | 54 |
| Destinations not revealable | 1,496 | 307 | 604 | 35 | 550 |
| Destinations and/or consumer uses not available: | | | | | |
| Great Lakes movement: | | | | | |
| Canadian commercial docks | [3] 836 | ---------- | ---------- | ---------- | ---------- |
| Vessel fuel | 1,106 | ---------- | ---------- | ---------- | ---------- |
| U.S. dock storage | −327 | ---------- | ---------- | ---------- | ---------- |
| Tidewater movement: | | | | | |
| Overseas exports (except Canada) | 33,733 | ---------- | ---------- | ---------- | ---------- |
| Bunker fuel | 17 | ---------- | ---------- | ---------- | ---------- |
| U.S. dock storage | 9 | ---------- | ---------- | ---------- | ---------- |
| Railroad fuel: | | | | | |
| U.S. companies | 1,321 | ---------- | ---------- | ---------- | ---------- |
| Canadian companies | 116 | ---------- | ---------- | ---------- | ---------- |
| Coal used at mines and sales to employees | 1,956 | ---------- | ---------- | ---------- | ---------- |
| Net change in mine inventory | −362 | ---------- | ---------- | ---------- | ---------- |
| Total | 485,465 | ---------- | ---------- | ---------- | ---------- |

[1] Excludes vessel fuel and bunker fuel, the destinations of which are not available.
[2] A considerable block of tonnage is included under "Destinations not revealable."
[3] Excludes shipments to Canadian Great Lakes commercial docks and Canadian railroad companies.

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Table 68 shows, on a comparative basis, the total tons shipped to all types of consumers from 1959 through 1964, and what percentage of total shipments during each year moved to each geographic region and State. From these data one can readily determine the size of the total market, the relative position of regional and State markets in relation to the whole, and the trend of shipments to these markets from year to year. The regional and State data reported in this table exclude shipments for United States railroad fuel, vessel fuel, bunker fuel, coal used at mines and sales to employees, overseas exports, and net change in mine inventory, because the ultimate destinations of these tonnages are not available. This information, where available, is shown in totals at the end of the table.

Table 69 shows the quantitative changes in total tons shipped, expressed in indexes, that took place throughout the country, by geographic division, State of destination, and consumer use, for the years 1957 and 1960 through 1964. The year 1957 is used as the base year, representing 100. For example, the total shipments of bituminous coal and lignite in the United States in 1957 amounted to 493,895,000 tons. This sum represents 100. Total shipments in 1960 represented only 84.3 percent of the 1957 level, while in 1961 total shipments compared with 1957 figures amounted to 81.6 percent. In 1964 they represented 98.3 percent.

To indicate the size of the bituminous coal and lignite market, quantitatively, in each geographic division, State, and consumer use category, the 1957 total tons shipped are shown in the table in lieu of the index numbers of 100 which each tonnage figure represents (except those otherwise noted).

These distribution data are based on reports submitted to the Bureau of Mines voluntarily by producers, sales agents, distributors, and wholesalers who normally produce or sell 100,000 tons or more annually. The unprecedented cooperation of these respondents resulted in their reporting about 94 percent of all coal produced or shipped. To account for total industry shipments, estimates for the remaining shipments are included, based on data from coal trade and other reliable coal statistical reporting agencies.

Details of the bituminous coal and lignite distribution for 1964 are presented in a Bureau of Mines report.[5]

[5] Bureau of Mines. Bituminous Coal and Lignite Distribution Calendar Year 1964. Mineral Industry Surveys, March 1965, 21 pp.

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**TABLE 68.—Total bituminous coal and lignite shipments and percent of grand total shipments, 1959-64, by geographic division and State of destination**

| Geographic division and State of destination | Thousand tons | | | | | | Percent of total | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
| Total | 412,245 | 416,119 | 403,262 | 424,627 | 456,137 | 485,465 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| New England | 11,150 | 9,313 | 9,674 | 9,997 | 10,017 | 10,007 | 2.7 | 2.2 | 2.4 | 2.4 | 2.2 | 2.0 |
| Massachusetts | 4,924 | 4,031 | 4,014 | 4,342 | 4,346 | 4,160 | 1.2 | 1.0 | 1.0 | 1.0 | 1.0 | .8 |
| Connecticut | 3,850 | 3,758 | 3,956 | 4,047 | 4,341 | 4,767 | .9 | .9 | 1.0 | 1.0 | .9 | 1.0 |
| Maine, New Hampshire, Vermont, and Rhode Island | 2,376 | 1,524 | 1,704 | 1,608 | 1,330 | 1,080 | .6 | .3 | .4 | .4 | .3 | .2 |
| Middle Atlantic | 75,082 | 76,173 | 72,076 | 76,107 | 79,492 | 90,150 | 18.2 | 18.3 | 17.9 | 17.9 | 17.4 | 18.6 |
| New York | 22,974 | 22,980 | 21,092 | 21,737 | 22,417 | 25,932 | 5.6 | 5.5 | 5.2 | 5.1 | 4.9 | 5.3 |
| New Jersey | 6,087 | 5,910 | 6,455 | 6,901 | 6,874 | 7,526 | 1.5 | 1.4 | 1.6 | 1.6 | 1.5 | 1.6 |
| Pennsylvania | 46,021 | 47,283 | 44,529 | 47,469 | 50,201 | 56,692 | 11.1 | 11.4 | 11.1 | 11.2 | 11.0 | 11.7 |
| East North Central | 161,242 | 158,125 | 151,278 | 159,391 | 164,423 | 173,307 | 39.1 | 38.0 | 37.5 | 37.5 | 36.0 | 35.7 |
| Ohio | [1] 50,071 | 49,624 | 44,998 | 48,324 | 49,157 | 51,092 | [1] 12.2 | 11.9 | 11.2 | 11.4 | 10.8 | 10.5 |
| Indiana | [1] 31,000 | 32,283 | 31,894 | 31,824 | 33,124 | 35,885 | [1] 7.5 | 7.8 | 7.9 | 7.5 | 7.2 | 7.4 |
| Illinois | 39,720 | 38,705 | 37,479 | 39,259 | 39,086 | 41,466 | 9.6 | 9.3 | 9.3 | 9.2 | 8.6 | 8.5 |
| Michigan | 27,231 | 25,076 | 24,327 | 27,255 | 29,888 | 30,936 | 6.6 | 6.0 | 6.0 | 6.4 | 6.5 | 6.4 |
| Wisconsin | 13,220 | 12,437 | 12,580 | 12,729 | 13,168 | 13,928 | 3.2 | 3.0 | 3.1 | 3.0 | 2.9 | 2.9 |
| West North Central | 21,023 | 22,571 | 20,920 | 22,520 | 23,242 | 23,918 | 5.1 | 5.4 | 5.2 | 5.3 | 5.1 | 4.9 |
| Minnesota | 5,378 | 6,375 | 5,891 | 5,768 | 6,143 | 7,077 | 1.3 | 1.5 | 1.5 | 1.4 | 1.3 | 1.4 |
| Iowa | 5,062 | 4,946 | 4,439 | 5,047 | 5,271 | 4,849 | 1.2 | 1.2 | 1.1 | 1.2 | 1.2 | 1.0 |
| Missouri | 6,944 | 7,279 | 6,847 | 7,685 | 7,896 | 8,154 | 1.7 | 1.7 | 1.7 | 1.8 | 1.7 | 1.7 |
| North Dakota and South Dakota | 2,434 | 2,453 | 2,425 | 2,390 | 2,113 | 2,191 | .6 | .6 | .6 | .5 | .5 | .5 |
| Nebraska and Kansas | 1,205 | 1,518 | 1,318 | 1,630 | 1,819 | 1,647 | .3 | .4 | .3 | .4 | .4 | .3 |
| South Atlantic | 50,682 | 52,547 | 55,316 | 57,891 | 63,816 | 67,866 | 12.3 | 12.6 | 13.7 | 13.6 | 14.0 | 14.0 |
| Delaware and Maryland | 8,122 | 9,031 | 9,351 | 9,884 | 10,968 | 12,317 | 2.0 | 2.2 | 2.3 | 2.3 | 2.4 | 2.6 |
| District of Columbia | 1,105 | 1,002 | 968 | 813 | 718 | 638 | .3 | .2 | .2 | .2 | .2 | .1 |
| Virginia | 11,147 | 11,685 | 12,343 | 12,823 | 13,323 | 13,787 | 2.7 | 2.8 | 3.1 | 3.0 | 2.9 | 2.8 |
| West Virginia | 14,143 | 13,778 | 14,661 | 15,272 | 16,742 | 18,205 | 3.4 | 3.3 | 3.6 | 3.6 | 3.7 | 3.8 |
| North Carolina | 8,946 | 8,667 | 9,295 | 9,980 | 11,187 | 11,595 | 2.2 | 2.1 | 2.3 | 2.4 | 2.4 | 2.4 |
| South Carolina | 3,444 | 3,591 | 3,800 | 3,921 | 4,442 | 4,401 | .8 | .9 | 1.0 | .9 | 1.0 | .9 |
| Georgia and Florida | 3,775 | 4,793 | 4,898 | 5,198 | 6,436 | 6,923 | .9 | 1.1 | 1.2 | 1.2 | 1.4 | 1.4 |
| East South Central | 38,907 | 41,556 | 40,771 | 42,709 | 47,418 | 49,849 | 9.4 | 10.0 | 10.1 | 10.0 | 10.4 | 10.3 |
| Kentucky | 11,301 | 11,270 | 11,340 | 11,873 | 15,453 | 16,148 | 2.7 | 2.7 | 2.8 | 2.8 | 3.4 | 3.3 |
| Tennessee | [2] 13,744 | 14,786 | 13,588 | 14,120 | 14,952 | 14,075 | [2] 3.3 | 3.6 | 3.4 | 3.3 | 3.3 | 2.9 |
| Alabama and Mississippi | [2] 13,862 | 15,500 | 15,843 | 16,716 | 17,013 | 19,626 | [2] 3.4 | 3.7 | 3.9 | 3.9 | 3.7 | 4.1 |
| West South Central: Arkansas, Louisiana, Oklahoma, and Texas | 1,387 | 1,114 | 802 | 839 | 802 | 1,099 | .3 | .3 | .2 | .2 | .2 | .2 |
| Mountain | 7,346 | 8,536 | 8,932 | 8,898 | 10,823 | 12,455 | 1.8 | 2.1 | 2.2 | 2.1 | 2.4 | 2.6 |
| Colorado | 2,781 | 2,887 | 3,242 | 3,340 | 3,752 | 3,877 | .7 | .7 | .8 | .8 | .8 | .8 |
| Utah | 2,508 | 3,377 | 3,046 | 2,417 | 2,334 | 2,706 | .6 | .8 | .8 | .6 | .5 | .6 |
| Montana and Idaho | 941 | 952 | 1,045 | 1,108 | 1,066 | 1,190 | .3 | .2 | .3 | .3 | .3 | .3 |
| Wyoming | 894 | 1,006 | 1,328 | 1,438 | 1,977 | 1,936 | .2 | .3 | .3 | .3 | .4 | .4 |
| New Mexico | 113 | 171 | 138 | 107 | 1,132 | 2,109 | (3) | .1 | (3) | (3) | .3 | .4 |
| Arizona and Nevada | 109 | 143 | 133 | 488 | 562 | 577 | (3) | (3) | (3) | .1 | .1 | .1 |

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| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pacific | 2,394 | 2,271 | 3,162 | 2,390 | 2,818 | 2,789 | .6 | .3 | .3 | .2 | .2 | .2 | .2 | .6 |
| Washington and Oregon | 897 | 953 | 992 | 964 | 828 | 774 | .2 | .3 | .3 | .4 | .4 | .4 | .4 | .2 |
| California | 1,497 | 1,318 | 2,170 | 1,426 | 1,990 | 2,015 | .4 | .3 | .5 | .4 | .4 | .4 | .4 | .4 |
| Alaska | 685 | 720 | 710 | 893 | 855 | 842 | .2 | .2 | .2 | .2 | .2 | .2 | .2 | .2 |
| Canada [1] | 12,381 | 11,413 | 11,166 | 11,702 | 13,724 | 14,180 | 3.0 | 2.7 | 2.8 | 2.8 | 2.8 | 3.0 | 3.0 | 2.9 |
| Mexico | 54 | 57 | 55 | 53 | 48 | 54 | (2) | (2) | (2) | (2) | (2) | (2) | (2) | (2) |
| Destinations not revealable | | 1,380 | 1,148 | 1,105 | 1,350 | 1,496 | .3 | .3 | .3 | .2 | .4 | .3 | .3 | .3 |
| U.S. railroad fuel | 2,513 | 2,124 | 1,792 | 1,602 | 1,452 | 1,321 | .6 | .5 | .4 | .4 | .4 | .3 | .3 | .3 |
| U.S. Great Lakes dock storage | 304 | 363 | −718 | −29 | 70 | −327 | .1 | .1 | −.2 | (2) | (2) | (2) | (2) | −.1 |
| U.S. tidewater dock storage | 26 | | 19 | | 6 | 9 | (2) | | (2) | | | | | (2) |
| Vessel fuel | 1,544 | 1,419 | 1,063 | 1,183 | 1,090 | 1,106 | .4 | .3 | .3 | .3 | .3 | .2 | .2 | .2 |
| Bunker fuel | 17 | 4 | 3 | 12 | 18 | 17 | (2) | (2) | (2) | (2) | (2) | (2) | (2) | (2) |
| Overseas exports | 24,835 | 24,818 | 23,780 | 27,041 | 33,317 | 33,733 | 6.0 | 6.0 | 5.9 | 6.4 | 6.4 | 7.8 | 7.8 | 7.0 |
| Coal used at mines and sales to employees | 1,907 | 1,676 | 1,366 | 1,272 | 1,753 | 1,956 | .5 | .4 | .3 | −.3 | −.2 | .4 | .4 | .4 |
| Net change in mine inventory | −1,234 | −61 | −63 | −949 | −97 | −362 | −.3 | (2) | (2) | | | (2) | (2) | −.1 |

[1] District 9 shipments via river and ex-river to Ohio electric utilities included with Indiana.

[2] District 10 shipments via river and ex-river to Alabama and Mississippi electric utilities included with Tennessee.

[3] Less than one-tenth of one percent.

[4] Includes shipments to Canadian Great Lakes commercial docks and Canadian railroad companies.

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**TABLE 69.—The changing levels of bituminous coal and lignite markets—indexes of physical volumes shipped to markets, 1957 and 1960–64, by geographic division, State of destination, and consumer use.**

| Geographic division, State of destination, and consumer use | 1957 (thousand tons) | Index 1957 = 100 except where noted) | | | | |
|---|---|---|---|---|---|---|
| | | 1960 | 1961 | 1962 | 1963 | 1964 |
| Total | 493,895 | 84.3 | 81.6 | 86.0 | 92.4 | 98.3 |
| Electric utilities | 166,754 | 108.4 | 110.1 | 120.4 | 131.5 | 142.7 |
| Coke and gas plants | 112,971 | 76.5 | 69.8 | 68.6 | 73.3 | 84.7 |
| Retail dealers | 39,237 | 82.0 | 74.7 | 73.0 | 66.3 | 56.4 |
| All others (includes vessel and bunker fuel | 109,711 | 85.4 | 83.4 | 87.6 | 90.8 | 92.2 |
| Railroad fuel, U.S. and Canada | 9,561 | 23.5 | 19.6 | 18.0 | 16.1 | 15.0 |
| Canadian Great Lakes commercial docks (consumer use not available) | 2,755 | 61.6 | 43.6 | 26.1 | 21.3 | 30.0 |
| U.S. Great Lakes dock storage (consumer use not available) | NA | 119.4 | −236.2 | −109.5 | 23.0 | −207.6 |
| U.S. tidewater dock storage (consumer use not available) | NA | .0 | 73.1 | ------- | 23.1 | 34.6 |
| Coal used at mines and sales to employees | 3,125 | 53.6 | 43.7 | 40.7 | 56.1 | 62.6 |
| Net change in mine inventory | 1,142 | −105.3 | −105.5 | −183.1 | −106.5 | −131.7 |
| Overseas exports (excludes Canada—consumer use not available) | 55,666 | 44.6 | 42.7 | 48.6 | 59.9 | 60.6 |
| New England | 11,909 | 78.2 | 81.2 | 83.9 | 84.1 | 84.0 |
| Electric utilities | 6,012 | 99.8 | 111.8 | 120.2 | 129.2 | 136.4 |
| Coke and gas plants | 1,345 | 42.4 | 35.3 | 35.3 | 35.1 | 35.4 |
| Retail dealers | 1,279 | 48.7 | 35.4 | 35.2 | 23.5 | 19.2 |
| All others | 3,273 | 64.8 | 61.8 | 57.0 | 45.1 | 33.2 |
| Massachusetts | 5,354 | 75.3 | 75.0 | 81.1 | 81.2 | 77.7 |
| Electric utilities | 2,575 | 94.0 | 103.8 | 119.1 | 133.3 | 133.0 |
| Coke and gas plants | 751 | 14.2 | .0 | .0 | .0 | .0 |
| Retail dealers | 755 | 55.2 | 36.7 | 38.3 | 21.5 | 21.2 |
| All others | 1,273 | 85.4 | 83.7 | 77.5 | 59.0 | 45.1 |
| Connecticut | 4,105 | 91.5 | 96.4 | 98.6 | 105.7 | 116.1 |
| Electric utilities | 2,567 | 110.2 | 121.1 | 127.2 | 136.0 | 155.2 |
| Coke and gas plants | 564 | 77.8 | 80.0 | 75.3 | 79.5 | 80.1 |
| Retail dealers | 139 | 61.9 | 44.6 | 46.8 | 34.5 | 18.7 |
| All others | 805 | 47.3 | 38.5 | 33.5 | 41.0 | 34.9 |
| Maine, New Hampshire, Vermont, and Rhode Island | 2,450 | 62.2 | 69.6 | 65.6 | 54.3 | 44.1 |
| Electric utilities | 870 | 86.3 | 108.3 | 102.6 | 97.2 | 90.7 |
| Retail dealers | 385 | 31.2 | 29.6 | 24.9 | 23.4 | 15.6 |
| All others | 1,195 | 54.6 | 54.2 | 51.0 | 33.0 | 19.3 |
| Middle Atlantic | 92,566 | 82.3 | 77.8 | 82.2 | 85.8 | 97.4 |
| Electric utilities | 31,662 | 96.7 | 97.2 | 104.5 | 108.3 | 121.4 |
| Coke and gas plants | 38,448 | 70.0 | 61.8 | 62.5 | 66.0 | 83.5 |
| Retail dealers | 2,496 | 71.3 | 65.7 | 61.6 | 54.3 | 45.8 |
| All others | 19,988 | 84.4 | 79.6 | 87.2 | 88.5 | 92.3 |
| New York | 26,753 | 85.9 | 78.8 | 81.3 | 83.8 | 96.9 |
| Electric utilities | 12,335 | 93.5 | 85.3 | 88.8 | 91.1 | 104.4 |
| Coke and gas plants | 5,693 | 75.6 | 66.4 | 70.2 | 70.6 | 100.5 |
| Retail dealers | 769 | 56.0 | 56.6 | 60.7 | 48.5 | 39.9 |
| All others | 7,956 | 84.4 | 79.8 | 79.5 | 85.3 | 88.2 |
| New Jersey | 7,814 | 75.6 | 82.6 | 88.3 | 88.0 | 96.3 |
| Electric utilities | 4,284 | 84.9 | 100.9 | 108.6 | 115.1 | 133.7 |
| Coke and gas plants | 1,249 | 59.7 | 45.1 | 35.2 | 31.8 | 28.6 |
| Retail dealers | 130 | 51.5 | 51.5 | 37.7 | 44.6 | 20.0 |
| All others | 2,151 | 68.0 | 69.8 | 81.9 | 69.2 | 66.1 |
| Pennsylvania | 58,029 | 81.5 | 76.7 | 81.8 | 86.5 | 97.7 |
| Electric utilities | 15,043 | 102.7 | 105.8 | 116.3 | 120.6 | 131.9 |
| Coke and gas plants | 31,506 | 69.4 | 61.6 | 62.2 | 68.9 | 82.6 |
| Retail dealers | 1,599 | 80.2 | 71.2 | 64.0 | 57.9 | 50.8 |
| All others | 9,881 | 88.0 | 81.5 | 94.6 | 95.3 | 101.3 |
| East North Central | [3] 170,697 | 92.6 | 88.6 | 93.4 | 96.3 | 101.5 |
| Electric utilities | 66,436 | 104.7 | 102.7 | 112.5 | 118.8 | 128.1 |
| Coke and gas plants | 38,757 | 79.2 | 70.0 | 68.4 | 71.5 | 80.9 |
| Retail dealers | 21,321 | 82.1 | 76.0 | 74.8 | 66.7 | 56.7 |
| All others | [3] 44,183 | 91.3 | 90.0 | 95.5 | 98.6 | 100.3 |
| Ohio | 55,612 | 89.2 | 80.9 | 86.9 | 88.4 | 91.9 |
| Electric utilities | 20,193 | 105.9 | 100.2 | 108.5 | 113.9 | 117.7 |
| Coke and gas plants | 15,661 | 75.9 | 58.3 | 60.5 | 57.9 | 66.8 |
| Retail dealers | 5,077 | 68.4 | 57.4 | 61.1 | 51.7 | 49.3 |
| All others | 14,681 | 87.9 | 86.6 | 94.1 | 98.6 | 97.8 |
| Indiana | 34,938 | 92.4 | 91.3 | 91.1 | 94.8 | 102.7 |
| Electric utilities | 12,853 | 106.8 | 106.8 | 115.2 | 119.5 | 132.4 |
| Coke and gas plants | 13,736 | 80.3 | 78.3 | 69.9 | 77.9 | 86.3 |
| Retail dealers | 2,796 | 78.0 | 72.6 | 69.0 | 62.2 | 48.7 |
| All others | 5,553 | 96.5 | 96.9 | 99.0 | 96.0 | 101.7 |
| Illinois | [3] 42,718 | 90.6 | 87.7 | 91.9 | 91.5 | 97.1 |
| Electric utilities | 18,584 | 103.0 | 103.2 | 109.7 | 112.6 | 123.7 |
| Coke and gas plants | 3,925 | 75.1 | 70.7 | 73.2 | 71.3 | 84.3 |
| Retail dealers | 8,623 | 76.2 | 66.1 | 67.3 | 61.3 | 55.8 |
| All others | [3] 11,586 | 86.8 | 84.8 | 88.1 | 87.0 | 89.4 |

See footnotes at end of table.

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**TABLE 69.—The changing levels of bituminous coal and lignite markets—indexes of physical volumes shipped to markets, 1957 and 1960–64, by geographic division, State of destination, and consumer use—Continued**

| Geographic division, State of destination, and consumer use | 1957 (thousand tons) | Index 1957=100 (except where noted) | | | | |
|---|---|---|---|---|---|---|
| | | 1960 | 1961 | 1962 | 1963 | 1964 |
| East North Central—Continued | | | | | | |
| Michigan | 26,255 | 95.5 | 92.7 | 103.8 | 113.8 | 117.8 |
| Electric utilities | 9,839 | 103.6 | 101.6 | 124.8 | 138.0 | 149.3 |
| Coke and gas plants | 4,877 | 92.6 | 84.5 | 87.1 | 98.7 | 108.9 |
| Retail dealers | 3,368 | 73.0 | 74.6 | 70.0 | 64.0 | 52.6 |
| All others | 8,171 | 96.8 | 94.2 | 102.5 | 114.3 | 112.2 |
| Wisconsin | 11,174 | 111.3 | 112.6 | 113.9 | 117.8 | 124.6 |
| Electric utilities | 4,967 | 103.7 | 101.6 | 108.1 | 122.6 | 134.1 |
| Coke and gas plants | 558 | 60.9 | 62.4 | 52.9 | 60.9 | 74.7 |
| Retail dealers | 1,457 | 194.2 | 209.0 | 189.8 | 166.0 | 142.5 |
| All others | 4,192 | 98.3 | 98.8 | 102.5 | 103.1 | 113.8 |
| West North Central | [3] 20,824 | 108.4 | 100.5 | 108.1 | 111.6 | 114.9 |
| Electric utilities | 8,278 | 127.3 | 123.9 | 147.6 | 159.2 | 166.9 |
| Coke and gas plants | 1,518 | 62.3 | 39.0 | 50.6 | 51.1 | 78.3 |
| Retail dealers | 4,079 | 101.1 | 89.5 | 79.9 | 63.8 | 53.4 |
| All others | [3] 6,949 | 100.2 | 92.4 | 90.3 | 96.2 | 96.9 |
| Minnesota | 5,332 | 119.6 | 110.5 | 108.2 | 115.2 | 132.7 |
| Electric utilities | 1,810 | 162.9 | 154.5 | 169.0 | 176.7 | 212.7 |
| Coke and gas plants | 1,206 | 60.6 | 43.2 | 52.4 | 55.0 | 85.5 |
| Retail dealers | 553 | 176.1 | 178.7 | 131.5 | 122.1 | 105.1 |
| All others | 1,763 | 97.7 | 90.0 | 76.7 | 91.1 | 91.7 |
| Iowa | [3] 4,878 | 101.4 | 91.0 | 103.5 | 108.1 | 99.4 |
| Electric utilities | 1,846 | 111.6 | 100.6 | 127.1 | 137.3 | 125.6 |
| Retail dealers | 1,254 | 74.9 | 63.2 | 63.9 | 56.9 | 43.7 |
| All others | [3] 1,778 | 109.5 | 100.7 | 106.8 | 113.7 | 111.5 |
| Missouri | 6,862 | 106.1 | 99.8 | 112.0 | 115.1 | 118.1 |
| Electric utilities | 2,605 | 138.1 | 142.2 | 176.2 | 200.2 | 208.0 |
| Coke and gas plants | 312 | 68.6 | 22.8 | 43.6 | 36.2 | 50.6 |
| Retail dealers | 1,495 | 81.8 | 68.3 | 61.7 | 36.2 | 30.6 |
| All others | 2,450 | 91.6 | 83.7 | 83.1 | 82.8 | 86.6 |
| North Dakota and South Dakota | 2,416 | 101.5 | 100.4 | 98.9 | 87.5 | 90.7 |
| Electric utilities | 1,378 | 91.1 | 99.3 | 103.7 | 89.5 | 94.6 |
| Retail dealers | 517 | 135.4 | 126.5 | 118.6 | 101.4 | 93.0 |
| All others | 521 | 95.4 | 77.2 | 66.8 | 68.3 | 77.9 |
| Nebraska and Kansas | 1,336 | 113.6 | 98.7 | 122.0 | 139.2 | 123.3 |
| Electric utilities | 639 | 106.3 | 82.6 | 124.3 | 156.2 | 144.8 |
| Retail dealers | 260 | 111.2 | 75.4 | 75.8 | 56.9 | 43.1 |
| All others | 437 | 125.9 | 135.9 | 146.2 | 154.0 | 139.6 |
| South Atlantic | 52,560 | 100.0 | 105.2 | 110.1 | 121.4 | 129.1 |
| Electric utilities | 22,251 | 122.1 | 134.0 | 143.6 | 161.7 | 174.0 |
| Coke and gas plants | 11,321 | 74.6 | 73.4 | 73.5 | 79.6 | 90.5 |
| Retail dealers | 4,765 | 77.9 | 66.3 | 70.0 | 67.2 | 66.3 |
| All others | 14,223 | 93.0 | 98.6 | 100.5 | 109.9 | 110.7 |
| Delaware and Maryland | 10,358 | 87.2 | 90.3 | 95.4 | 105.9 | 118.9 |
| Electric utilities | 3,000 | 125.4 | 137.6 | 144.2 | 167.3 | 192.5 |
| Coke and gas plants | 5,414 | 76.6 | 76.3 | 82.6 | 81.5 | 92.8 |
| Retail dealers | 420 | 55.0 | 51.0 | 56.9 | 80.2 | 84.3 |
| All others | 1,524 | 58.4 | 57.6 | 55.6 | 78.9 | 76.4 |
| District of Columbia | 1,097 | 91.3 | 88.2 | 74.1 | [4] 65.5 | [4] 58.2 |
| Electric utilities | 609 | 70.1 | 67.7 | 52.5 | 59.1 | 61.4 |
| Retail dealers | 188 | 73.4 | 77.1 | 78.7 | 80.3 | 72.3 |
| All others | 300 | 145.7 | 137.0 | 115.0 | [4] 69.0 | [4] 42.7 |
| Virginia | 10,553 | 110.7 | 117.0 | 121.5 | 126.2 | 130.6 |
| Electric utilities | 4,435 | 138.2 | 151.2 | 162.2 | 166.9 | 176.4 |
| Coke and gas plants | 165 | 101.8 | 46.7 | 19.4 | 30.3 | 76.4 |
| Retail dealers | 1,756 | 75.5 | 64.5 | 62.6 | 59.3 | 61.4 |
| All others | 4,197 | 96.7 | 105.5 | 107.1 | 115.1 | 113.4 |
| West Virginia | 15,771 | 87.4 | 93.0 | 96.8 | 106.2 | 115.4 |
| Electric utilities | 6,290 | 94.8 | 103.2 | 111.2 | 114.2 | 121.3 |
| Coke and gas plants | 5,742 | 71.8 | 71.4 | 66.4 | 79.2 | 88.7 |
| Retail dealers | 302 | 83.1 | 82.8 | 112.9 | 94.0 | 85.4 |
| All others | 3,437 | 100.0 | 111.1 | 119.9 | 137.5 | 152.0 |
| North Carolina | 8,716 | 99.4 | 106.6 | 114.5 | 128.4 | 133.0 |
| Electric utilities | 4,953 | 108.1 | 123.0 | 135.4 | 160.0 | 171.4 |
| Retail dealers | 1,248 | 82.3 | 66.8 | 70.6 | 63.9 | 59.8 |
| All others | 2,515 | 90.9 | 94.2 | 95.1 | 98.0 | 93.9 |
| South Carolina | 3,050 | 117.7 | 124.6 | 128.6 | 145.6 | 144.3 |
| Electric utilities | 856 | 192.5 | 222.8 | 236.8 | 289.0 | 303.9 |
| Retail dealers | 321 | 107.5 | 84.1 | 90.0 | 91.0 | 94.1 |
| All others | 1,873 | 85.3 | 86.7 | 85.7 | 89.5 | 80.0 |
| Georgia and Florida | 3,015 | 159.0 | 162.5 | 172.4 | 213.5 | 229.6 |
| Electric utilities | 2,108 | 184.1 | 193.8 | 207.8 | 266.4 | 286.1 |
| Coke and gas plants | | | | | | |
| Retail dealers | 530 | 74.5 | 59.4 | 63.4 | 56.4 | 53.8 |
| All others | 377 | 137.1 | 132.1 | 127.9 | 138.2 | 160.7 |

See footnotes at end of table.

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**TABLE 69.—The changing levels of bituminous coal and lignite markets—indexes of physical volumes shipped to markets, 1957 and 1960–64, by geographic division, State of destination, and consumer use—Continued**

| Geographic division, State of destination, and consumer use | 1957 (thousand tons) | Index 1957=100 (except where noted) | | | | |
|---|---|---|---|---|---|---|
| | | 1960 | 1961 | 1962 | 1963 | 1964 |
| East South Central | 43,283 | 96.0 | 94.2 | 96.5 | 109.6 | 115.2 |
| Electric utilities | 23,572 | 112.6 | 115.0 | 122.4 | 137.6 | 145.3 |
| Coke and gas plants | 10,380 | 80.8 | 69.8 | 70.3 | 73.6 | 81.7 |
| Retail dealers | 2,494 | 78.5 | 74.7 | 72.6 | 80.2 | 62.1 |
| All others | 6,837 | 68.3 | 66.6 | 69.3 | 78.1 | 81.5 |
| Kentucky | 11,167 | 100.9 | 101.5 | 106.3 | 138.4 | 144.6 |
| Electric utilities | 6,758 | 107.6 | 108.1 | 117.8 | 154.4 | 165.4 |
| Coke and gas plants | 1,683 | 87.6 | 91.0 | 83.8 | 111.5 | 110.9 |
| Retail dealers | 834 | 83.8 | 99.6 | 77.2 | 95.3 | 77.3 |
| All others | 1,892 | 96.3 | 88.3 | 98.4 | 128.9 | 129.8 |
| Tennessee | 15,104 | 97.9 | 90.0 | 93.5 | 99.0 | 93.2 |
| Electric utilities | 9,876 | 119.2 | 107.2 | 112.8 | 119.4 | 112.1 |
| Coke and gas plants | 258 | 73.6 | 89.9 | 96.5 | 84.5 | 59.3 |
| Retail dealers | 1,206 | 81.0 | 69.4 | 71.6 | 72.1 | 61.2 |
| All others | 3,764 | 49.0 | 51.4 | 49.5 | 55.0 | 56.2 |
| Alabama and Mississippi | 17,012 | 91.9 | 93.1 | 98.3 | 100.0 | 115.4 |
| Electric utilities | 6,938 | 107.9 | 133.0 | 140.7 | 147.1 | 173.0 |
| Coke and gas plants | 8,439 | 79.7 | 64.9 | 66.8 | 65.7 | 76.5 |
| Retail dealers | 454 | 62.3 | 43.0 | 66.5 | 73.8 | 36.6 |
| All others | 1,181 | 85.0 | 80.0 | 85.8 | 78.6 | 84.8 |
| West South Central: Arkansas, Louisiana, Oklahoma, and Texas | 1,868 | 59.6 | 42.9 | 44.9 | 42.9 | 88.8 |
| Electric utilities [4] | 65 | .0 | .0 | .0 | 100.0 | 75.0 |
| Coke and gas plants | 1,050 | 67.3 | 49.0 | 61.5 | 58.7 | 82.5 |
| Retail dealers | 161 | 44.1 | 28.0 | 28.6 | 23.0 | 19.3 |
| All others | 592 | 56.8 | 41.0 | 24.8 | 22.3 | 31.1 |
| Mountain | 8,779 | 97.2 | 101.7 | 101.4 | 123.3 | 141.9 |
| Electric utilities | 1,437 | 193.5 | 237.1 | 263.6 | 406.8 | 485.0 |
| Coke and gas plants | 3,772 | 80.9 | 76.5 | 60.9 | 66.3 | 74.1 |
| Retail dealers | 1,350 | 86.4 | 82.7 | 88.4 | 83.1 | 86.3 |
| All others | 2,220 | 69.3 | 68.6 | 73.0 | 63.2 | 68.7 |
| Colorado | 3,264 | 88.4 | 99.3 | 102.3 | 115.0 | 118.8 |
| Electric utilities | 687 | 177.1 | 205.1 | 227.4 | 264.3 | 281.2 |
| Coke and gas plants | 1,324 | 64.6 | 75.4 | 70.4 | 85.6 | 83.5 |
| Retail dealers | 326 | 81.3 | 85.9 | 100.0 | 87.7 | 102.1 |
| All others | 927 | 59.3 | 59.9 | 56.1 | 55.7 | 54.7 |
| Utah | 3,748 | 90.1 | 81.3 | 64.5 | 62.3 | 72.2 |
| Electric utilities | 367 | 137.6 | 150.4 | 124.0 | 118.8 | 111.7 |
| Coke and gas plants | 2,448 | 89.7 | 77.1 | 55.8 | 54.4 | 69.0 |
| Retail dealers | 334 | 76.9 | 75.1 | 81.7 | 73.1 | 69.5 |
| All others | 599 | 70.1 | 59.3 | 54.1 | 53.9 | 62.4 |
| Montana and Idaho | 923 | 103.1 | 113.2 | 120.0 | 115.5 | 128.9 |
| Electric utilities [4] | 1 | 105.6 | 149.2 | 164.8 | 160.3 | 164.2 |
| Retail dealers | 593 | 87.5 | 80.6 | 80.9 | 80.8 | 80.6 |
| All others | 329 | 74.2 | 91.2 | 101.2 | 91.2 | 127.1 |
| Wyoming | 607 | 165.7 | 218.8 | 236.9 | 325.7 | 318.9 |
| Electric utilities | 340 | 245.6 | 336.2 | 326.8 | 520.3 | 518.2 |
| Retail dealers | 61 | 96.7 | 91.8 | 98.4 | 86.9 | 82.0 |
| All others | 206 | 54.4 | 62.6 | 129.6 | 75.2 | 60.2 |
| New Mexico [7] | 92 | 15.1 | 12.2 | 9.5 | 100.0 | 191.6 |
| Electric utilities [7] | 37 | 2.7 | 3.0 | 2.8 | 100.0 | 195.0 |
| Retail dealers | 12 | 358.3 | 291.7 | 250.0 | 183.3 | 150.0 |
| All others | 43 | 230.2 | 162.8 | 109.3 | 58.1 | 81.4 |
| Arizona and Nevada | 145 | 98.6 | 91.7 | 336.6 | 387.6 | 397.9 |
| Electric utilities [8] | 5 | 1.5 | .9 | 100.0 | 131.0 | 136.1 |
| Retail dealers | 24 | 100.0 | 70.8 | 100.0 | 158.3 | 225.0 |
| All others | 116 | 98.3 | 97.4 | 111.2 | 73.3 | 57.8 |
| Pacific | 3,142 | 72.3 | 100.6 | 76.1 | 80.1 | 88.8 |
| Electric utilities | 4 | .0 | .0 | .0 | .0 | .0 |
| Coke and gas plants | 1,708 | 75.3 | 124.2 | 80.9 | 96.8 | 115.7 |
| Retail dealers | 377 | 95.0 | 106.9 | 77.7 | 72.4 | 75.9 |
| All others | 1,053 | 59.5 | 60.6 | 68.0 | 56.2 | 50.0 |
| Washington and Oregon | 1,324 | 72.0 | 74.9 | 72.8 | 62.5 | 58.5 |
| Electric utilities | 3 | .0 | .0 | .0 | .0 | .0 |
| Retail dealers | 367 | 95.6 | 108.2 | 78.2 | 73.3 | 73.7 |
| All others | 954 | 63.1 | 62.4 | 71.0 | 58.6 | 52.0 |
| California | 1,818 | 72.5 | 119.4 | 78.4 | 93.0 | 110.8 |
| Electric utilities | 1 | .0 | .0 | .0 | .0 | .0 |
| Coke and gas plants | 1,706 | 75.3 | 124.2 | 80.9 | 96.8 | 115.7 |
| Retail dealers | 10 | 70.0 | 60.0 | 60.0 | 40.0 | 80.0 |
| All others | 99 | 25.3 | 43.4 | 39.4 | 33.3 | 31.3 |
| Alaska | 829 | 86.9 | 85.6 | 107.7 | 103.1 | 101.6 |
| Electric utilities | 470 | 87.7 | 43.8 | 61.5 | 71.5 | 75.3 |
| Retail dealers | 49 | 134.7 | 134.7 | 155.1 | 108.2 | 89.8 |
| All others | 310 | 78.1 | 141.3 | 170.3 | 150.3 | 143.2 |

See footnotes at end of table.

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**TABLE 69.—The changing levels of bituminous coal and lignite markets—indexes of physical volumes shipped to markets, 1957 and 1960–64, by geographic division, State of destination, and consumer use—Continued**

| Geographic division, State of destination, and consumer use | 1957 (thousand tons) | Index 1957=100 (except where noted) | | | | |
|---|---|---|---|---|---|---|
| | | 1960 | 1961 | 1962 | 1963 | 1964 |
| Canada [9] | 17,878 | 63.8 | 62.5 | 65.5 | 76.8 | 80.8 |
| Electric utilities | 567 | 30.7 | 21.5 | 206.2 | 437.9 | 560.0 |
| Coke and gas plants | 4,602 | 102.5 | 114.2 | 109.6 | 122.8 | 120.5 |
| Retail dealers | 857 | 81.3 | 75.5 | 74.6 | 94.6 | 64.4 |
| All others | 7,183 | 55.5 | 53.4 | 55.7 | 57.0 | 55.0 |
| Canadian Great Lakes Commercial docks (consumer use not available) | 2,785 | 61.6 | 43.6 | 26.1 | 21.3 | 30.0 |
| Canadian railroad companies | 1,884 | 6.7 | 5.0 | 6.5 | 4.9 | 6.2 |
| Mexico [10] | NA | 100.0 | 96.5 | 93.0 | 84.2 | 94.7 |
| All others [10] | NA | 100.0 | 96.5 | 93.0 | 84.2 | 94.7 |
| Destinations not revealable [11] | | 100.0 | 83.2 | 80.1 | 97.8 | 108.4 |
| Electric utilities [11] | | 100.0 | 74.6 | 42.1 | 34.2 | 61.8 |
| Coke and gas plants [11] | | 100.0 | 141.2 | 172.7 | 161.0 | 161.5 |
| Retail dealers [11] | | 100.0 | 69.7 | 32.3 | 32.3 | 35.4 |
| All others [11] | | 100.0 | 43.9 | 53.2 | 133.2 | 134.1 |
| Destinations not available | | | | | | |
| Great Lakes vessel fuel [12] | 1,859 | 76.3 | 58.3 | 63.6 | 58.6 | 59.5 |
| Tidewater bunker fuel [12] | 41 | 9.8 | 7.3 | 29.3 | 43.9 | 41.5 |
| Railroad fuel, United States companies [13] | 7,697 | 27.6 | 23.2 | 22.4 | 18.9 | 17.2 |

NA Not available.
[1] For Great Lakes dock storage the annual base period is 1959=100. The 1959 annual tonnage was 304 tons.
[2] For tidewater dock storage the annual base period is 1959=100. The 1959 annual tonnage was 26 tons.
[3] District 15 shipments to Illinois included with Iowa.
[4] A considerable block of tonnage is included under "Destinations not revealable."
[5] For electric utilities in Arkansas, Louisiana, Oklahoma, and Texas the annual base period is 1963=100. The 1963 tonnage shipped to electric utilities was 24,000 tons.
[6] For electric utilities in Montana and Idaho the annual base period is 1959=100. The 1959 tonnage shipped to electric utilities was 179,000 tons.
[7] For total shipments and electric utilities to New Mexico the annual base period is 1963=100. Total shipments to New Mexico were 1,132,000 tons and for electric utilities 1,085,000 tons.
[8] For electric utilities in Arizona and Nevada the annual base period is 1962=100. The 1962 annual tonnage shipped to electric utilities was 335,000 tons.
[9] Includes shipments to Canadian Great Lakes commercial docks and Canadian railroad companies.
[10] Since tonnages for Mexico were first published in 1960, yearly indexes are based on 1960=100. In thousands of tons, 1960 tons were total 57, all others 57.
[11] Since "Destinations not revealable" were first published during 1960, the calendar year indexes are based on 1960=100. In thousands of tons these figures are as follows: Calendar year 1960 total not revealable 1,380, electric utilities 497, coke and gas plants 374, retail dealers 99, all others 410.
[12] Included in summary at beginning of table in all others.
[13] Included in summary at beginning of table in railroad fuel.

## RELATIVE RATE OF GROWTH OF MINERAL FUELS AND WATERPOWER

Information on the trends in consumption of the various energy fuels and waterpower is presented in the Review of Mineral-Fuel Industries, 1964 Minerals Yearbook, volume 2.

## STOCKS

The figures on stocks are based on complete coverage for all categories except "Other manufacturing and mining industries" and "Retail dealer stocks." Stocks for these two categories are based on samples, and the statistical procedure followed is that for calculating total consumption.

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**TABLE 70.—Stocks of bituminous coal and lignite in the hands of commercial consumers and in retail dealers' yards in the United States**

| Date | Total stocks (net tons) | Days' supply at current rate of consumption on date of stocktaking | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Electric power utilities | Manufacturing and mining industries | | | | Retail dealers | Total |
| | | | Oven coke plants | Steel and rolling mills | Cement mills | Other manufacturing and mining industries | | |
| 1963: | | | | | | | | |
| Jan. 31 | 63,804,000 | 71 | 38 | 15 | 49 | 39 | 3 | 36 |
| Feb. 28 | 59,473,000 | 66 | 36 | 15 | 45 | 36 | 2 | 33 |
| Mar. 31 | 56,959,000 | 72 | 31 | 17 | 40 | 38 | 4 | 31 |
| Apr. 30 | 59,764,000 | 81 | 30 | 21 | 38 | 44 | 9 | 37 |
| May 31 | 64,551,000 | 89 | 33 | 22 | 38 | 47 | 13 | 43 |
| June 30 | 67,638,000 | 87 | 36 | 27 | 40 | 52 | 20 | 48 |
| July 31 | 63,318,000 | 81 | 31 | 28 | 43 | 54 | 18 | 42 |
| Aug. 31 | 67,002,000 | 82 | 36 | 32 | 43 | 55 | 14 | 44 |
| Sept. 30 | 69,388,000 | 89 | 37 | 28 | 45 | 53 | 11 | 46 |
| Oct. 31 | 72,708,000 | 91 | 39 | 29 | 50 | 48 | 12 | 47 |
| Nov. 30 | 73,383,000 | 88 | 40 | 23 | 48 | 46 | 10 | 44 |
| Dec. 31 | 70,083,000 | 74 | 39 | 17 | 47 | 40 | 5 | 34 |
| 1964: | | | | | | | | |
| Jan. 31 | 66,536,000 | 71 | 36 | 18 | 55 | 39 | 5 | 32 |
| Feb. 29 | 64,430,000 | 70 | 36 | 17 | 47 | 37 | 4 | 31 |
| Mar. 31 | 63,041,000 | 73 | 37 | 16 | 40 | 38 | 4 | 34 |
| Apr. 30 | 65,043,000 | 81 | 37 | 19 | 40 | 43 | 7 | 39 |
| May 31 | 68,619,000 | 89 | 37 | 23 | 41 | 49 | 19 | 45 |
| June 30 | 70,700,000 | 82 | 39 | 25 | 40 | 51 | 19 | 44 |
| July 31 | 65,616,000 | 77 | 32 | 26 | 39 | 53 | 18 | 37 |
| Aug. 31 | 67,682,000 | 80 | 34 | 27 | 39 | 48 | 12 | 41 |
| Sept. 30 | 71,892,000 | 85 | 35 | 26 | 41 | 49 | 9 | 43 |
| Oct. 31 | 75,153,000 | 89 | 37 | 24 | 43 | 44 | 6 | 42 |
| Nov. 30 | 77,283,000 | 88 | 39 | 21 | 45 | 45 | 7 | 43 |
| Dec. 31 | 75,342,000 | 77 | 40 | 20 | 42 | 41 | 4 | 36 |

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## PRICES

**TABLE 71.—Average value per ton, f.o.b. mines, of bituminous coal and lignite produced in the United States, by States**

| State | 1963 | | | | 1964 | | | |
|---|---|---|---|---|---|---|---|---|
| | Underground | Strip | Auger | Total | Underground | Strip | Auger | Total |
| Alabama | $7.89 | $5.67 | $7.74 | $7.38 | $7.62 | $4.69 | $6.90 | $6.83 |
| Alaska | | 6.93 | | 6.93 | | 6.72 | | 6.72 |
| Arkansas | 7.17 | 6.64 | | 6.82 | 7.30 | 6.96 | | 7.08 |
| Colorado | 6.66 | 3.50 | | 5.93 | 5.92 | 3.43 | | 5.38 |
| Georgia | 3.63 | | | 3.63 | 3.82 | | | 3.82 |
| Illinois | 3.77 | 3.83 | | 3.80 | 3.76 | 3.81 | | 3.79 |
| Indiana | 4.07 | 3.67 | | 3.78 | 4.09 | 3.71 | | 3.80 |
| Iowa | 4.22 | 3.39 | | 3.50 | 4.09 | 3.43 | | 3.54 |
| Kansas | 4.54 | 4.54 | | 4.54 | | 4.55 | | 4.55 |
| Kentucky | 4.27 | 3.14 | 2.99 | 3.82 | 4.19 | 3.11 | 2.88 | 3.75 |
| Maryland | 4.10 | 3.51 | | 3.73 | 4.24 | 3.83 | | 3.97 |
| Missouri | 5.41 | 4.15 | 3.15 | 4.16 | 4.76 | 4.08 | | 4.08 |
| Montana: | | | | | | | | |
| Bituminous | 7.64 | 5.25 | | 7.51 | 7.57 | 1.90 | | 7.40 |
| Lignite | 4.64 | 1.90 | | 1.95 | 4.57 | 1.90 | | 1.95 |
| Total Montana | 7.36 | 1.94 | | 2.82 | 7.22 | 1.90 | | 2.68 |
| New Mexico | 6.02 | 2.29 | | 2.89 | 8.89 | 2.37 | | 3.29 |
| North Dakota (lignite) | 4.60 | 2.19 | | 2.19 | 4.62 | 2.14 | | 2.15 |
| Ohio | 4.28 | 3.49 | 3.20 | 3.70 | 4.26 | 3.48 | 3.23 | 3.60 |
| Oklahoma | 11.77 | 5.28 | | 5.63 | 7.43 | 5.30 | | 5.32 |
| Pennsylvania | 5.62 | 3.58 | 3.57 | 4.90 | 5.75 | 3.62 | 3.80 | 5.07 |
| South Dakota (lignite) | | 3.74 | | 3.74 | | 4.85 | | 4.85 |
| Tennessee | 3.81 | 3.60 | 3.35 | 3.71 | 3.98 | 3.50 | 3.33 | 3.79 |
| Utah | 5.22 | | | 5.22 | 7.03 | | | 7.03 |
| Virginia | 4.12 | 2.85 | 2.89 | 3.96 | 4.01 | 2.85 | 3.21 | 3.89 |
| Washington | 7.28 | 6.62 | | 7.26 | 8.45 | | | 8.45 |
| West Virginia | 4.90 | 3.57 | 3.50 | 4.79 | 5.02 | 3.72 | 3.75 | 4.90 |
| Wyoming | 6.17 | 3.06 | | 3.18 | 6.11 | 3.03 | | 3.15 |
| Total | 4.82 | 3.57 | 3.25 | 4.39 | 4.92 | 3.55 | 3.35 | 4.45 |

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**TABLE 72.—Production and average value per ton, f.o.b. mines, of bituminous coal and lignite sold in open market and not sold in open market, 1964, by States**

| State | Production | | | | | Average value per ton, f.o.b. mines | | |
|---|---|---|---|---|---|---|---|---|
| | Sold in open market | | Not sold in open market | | Total (net tons) | Sold in open market | Not sold in open market | Total |
| | Net tons | Percentage of total | Net tons | Percentage of total | | | | |
| Alabama | 6,553,020 | 45.4 | 7,882,434 | 54.6 | 14,435,454 | $5.71 | $7.82 | $6.83 |
| Alaska | 744,942 | 100.0 | | | 744,942 | 6.72 | | 6.72 |
| Arkansas | 212,315 | 100.0 | | | 212,315 | 7.08 | | 7.08 |
| Colorado | 3,262,155 | 74.9 | 1,093,090 | 25.1 | 4,355,245 | 5.04 | 6.39 | 5.36 |
| Georgia | 3,900 | 100.0 | | | 3,900 | 3.82 | | 3.82 |
| Illinois | 55,022,602 | 100.0 | | | 55,022,602 | 3.79 | | 3.79 |
| Indiana | 15,071,873 | 99.9 | 2,758 | .1 | 15,074,631 | 3.80 | 4.08 | 3.80 |
| Iowa | 973,214 | 100.0 | | | 973,214 | 3.54 | | 3.54 |
| Kansas | 1,263,409 | 100.0 | | | 1,263,409 | 4.55 | | 4.55 |
| Kentucky | 76,079,363 | 91.9 | 6,667,808 | 8.1 | 82,747,171 | 3.55 | 5.99 | 3.73 |
| Maryland | 1,135,836 | 100.0 | | | 1,135,836 | 3.97 | | 3.97 |
| Missouri | 3,253,430 | 100.0 | | | 3,253,430 | 4.08 | | 4.08 |
| Montana: | | | | | | | | |
| Bituminous | 45,906 | 100.0 | | | 45,906 | 7.40 | | 7.40 |
| Lignite | 299,941 | 100.0 | | | 299,941 | 1.95 | | 1.95 |
| Total Montana | 345,847 | 100.0 | | | 345,847 | 2.68 | | 2.68 |
| New Mexico | 2,593,481 | 87.3 | 375,991 | 12.7 | 2,969,472 | 2.40 | 9.41 | 3.29 |
| North Dakota (lignite) | 2,558,852 | 97.0 | 77,899 | 3.0 | 2,636,751 | 2.17 | 1.40 | 2.15 |
| Ohio | 31,918,655 | 85.5 | 5,391,722 | 14.5 | 37,310,377 | 3.78 | 3.19 | 3.69 |
| Oklahoma | 1,027,996 | 100.0 | | | 1,027,996 | 5.32 | | 5.32 |
| Pennsylvania | 46,701,758 | 61.0 | 29,829,000 | 39.0 | 76,530,758 | 4.16 | 6.50 | 5.07 |
| South Dakota (lignite) | 13,000 | 100.0 | | | 13,000 | 4.85 | | 4.85 |
| Tennessee | 5,942,035 | 99.2 | 48,370 | .8 | 5,990,405 | 3.79 | 3.53 | 3.79 |
| Utah | 2,310,752 | 49.0 | 2,409,091 | 51.0 | 4,719,843 | 4.62 | 9.34 | 7.03 |
| Virginia | 31,439,520 | 99.3 | 213,964 | .7 | 31,653,484 | 3.89 | 4.42 | 3.89 |
| Washington | 68,058 | 100.0 | | | 68,058 | 8.45 | | 8.45 |
| West Virginia | 122,313,617 | 86.5 | 19,094,881 | 13.5 | 141,408,498 | 4.73 | 6.03 | 4.90 |
| Wyoming | 1,565,597 | 50.5 | 1,535,717 | 49.5 | 3,101,314 | 3.66 | 2.63 | 3.15 |
| Total | 412,375,227 | 84.7 | 74,622,725 | 15.3 | 486,997,952 | 4.11 | 6.24 | 4.45 |

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# LIGNITE

**TABLE 73.—Summary of operations at lignite mines in the United States, 1964, by States [1]**

| Item | Montana | North Dakota | South Dakota | Total |
|---|---|---|---|---|
| **UNDERGROUND MINES** | | | | |
| Number of mines | 3 | 1 | | 4 |
| Shot from solid, net tons | 1,379 | 1,867 | | 3,246 |
| Cut by machines, do | 4,480 | | | 4,480 |
| Total production | 5,859 | 1,867 | | 7,726 |
| Number of cutting machines | 2 | | | 2 |
| Average output per machine, net tons | 2,240 | | | 2,240 |
| Underground production cut by machine, percent | 76.5 | | | 76.5 |
| Average value per ton | $4.57 | $4.62 | | $4.58 |
| Average number of men working daily | 13 | 5 | | 18 |
| Average number of days worked | 140 | 75 | | 122 |
| Number of man-days worked | 1,826 | 373 | | 2,199 |
| Average tons per man per day | 3.21 | 5.01 | | 3.51 |
| **STRIP MINES** | | | | |
| Number of strip mines | 1 | 28 | 1 | 30 |
| Production, net tons | 294,082 | 2,634,884 | 13,000 | 2,941,966 |
| Average value per ton | $1.90 | $2.14 | $4.85 | $2.13 |
| Number of shovels and draglines | 2 | 46 | 2 | 50 |
| Average number of men working daily | 16 | 275 | 8 | 299 |
| Average number of days worked | 245 | 202 | 163 | 203 |
| Number of man-days worked | 3,921 | 55,426 | 1,300 | 60,647 |
| Average tons per man per day | 75.00 | 47.54 | 10.00 | 48.51 |
| **TOTAL, ALL LIGNITE MINES** | | | | |
| Number of mines | 4 | 29 | 1 | 34 |
| Production (net tons): | | | | |
| Shipped by rail [2] | 293,117 | 2,013,298 | | 2,306,415 |
| Shipped by truck | 6,819 | 336,261 | 12,700 | 355,780 |
| Used at mines [3] | 5 | 287,192 | 300 | 287,497 |
| Total | 299,941 | 2,636,751 | 13,000 | 2,949,692 |
| Average value per ton | $1.95 | $2.15 | $4.85 | $2.14 |
| Average number of men working daily | 29 | 280 | 8 | 317 |
| Average number of days worked | 198 | 199 | 163 | 198 |
| Number of man-days worked | 5,747 | 55,799 | 1,300 | 62,846 |
| Average tons per man per day | 52.19 | 47.25 | 10.00 | 36.70 |

[1] Exclusive of Texas (lignite).
[2] Includes coal loaded at mines directly into railroad cars and hauled by trucks to railroad sidings.
[3] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor or tram.

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## FOREIGN TRADE

Imports of bituminous coal and lignite are very small. Exports have been an important item of foreign trade for many years, particularly since the close of World War II. See figure 16.

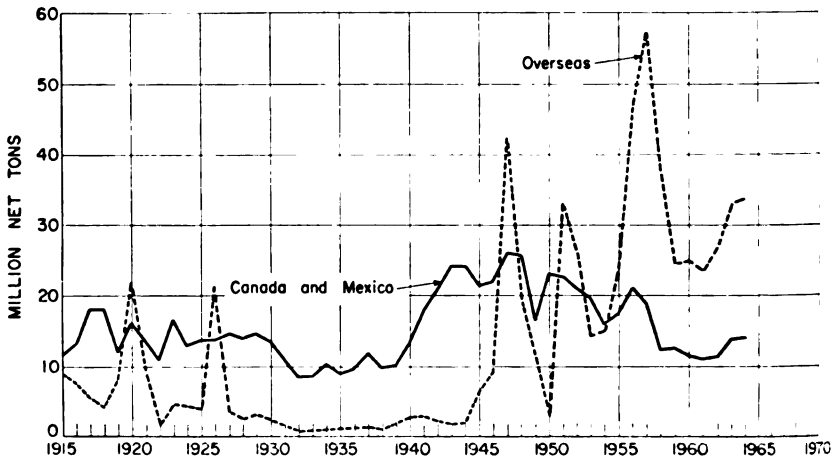


FIGURE 16.—Exports of bituminous coal and lignite from the United States to Canada and Mexico and overseas, 1915–64.

**TABLE 74.—Bituminous coal [1] imported for consumption in the United States, by countries and customs districts**

(Net tons)

| Country and customs district | 1962 | 1963 | 1964 |
|---|---|---|---|
| Country: | | | |
| North America: | | | |
| Canada | 232,417 | r 267,315 | 292,982 |
| Mexico | | | 51 |
| Europe: | | | |
| Germany, West | | r 34 | |
| United Kingdom | | 3 | |
| Asia: Japan | 7 | | 26 |
| Total | 232,424 | r 267,352 | 293,059 |
| Customs district: | | | |
| Alaska | 20 | 10 | 10 |
| Buffalo | 783 | r 51 | 61 |
| Dakota | | r 782 | 212 |
| Duluth and Superior | 2,214 | | |
| Hawaii | | | 76 |
| Laredo | | | 51 |
| Los Angeles | | 3 | |
| Maine and New Hampshire | 224,199 | r 262,720 | 276,471 |
| Massachusetts | 7 | | |
| Montana and Idaho | 5,196 | r 3,752 | 14,112 |
| New Orleans | | 34 | |
| Ohio | | | 63 |
| St. Lawrence | 5 | | |
| Washington | | | 2,001 |
| Total | 232,424 | r 267,352 | 293,059 |

r Revised.
[1] Includes slack, culm, and lignite.

Source: Bureau of the Census.

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**TABLE 75.—Exports of bituminous coal, by country groups**

(Thousand net tons)

| Year | Canada (including Newfoundland) and Mexico | Overseas (all other countries) | | | | | | | | Grand total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | West Indies and Central America [1] | Miquelon, Bermuda, and Greenland | South America | Europe | Asia | Africa | Oceania | Total overseas | |
| 1955-59 (average) | 16,232 | 35 | 3 | 1,899 | 34,310 | 4,107 | 178 | -------- | 40,532 | 56,764 |
| 1960 | 11,696 | 18 | 2 | 2,178 | 16,936 | 5,654 | 57 | -------- | 24,845 | 36,541 |
| 1961 | 11,223 | 3 | 3 | 1,786 | 15,275 | 6,617 | 63 | (2) | 23,747 | 34,970 |
| 1962 | 11,461 | 10 | 5 | 2,159 | 18,284 | 6,467 | 27 | -------- | 26,952 | 38,413 |
| 1963 | 13,809 | 6 | 5 | 1,933 | 25,218 | 6,064 | 43 | -------- | 33,269 | 47,078 |
| 1964 | 14,237 | 2 | 3 | 2,099 | 25,096 | 6,515 | 17 | -------- | 33,732 | 47,969 |

[1] Includes Panama.
[2] Less than ½ unit.

Source: Bureau of the Census.



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**TABLE 76.—Bituminous coal exported from the United States, by countries [1]**

(Net tons)

| Country | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|
| North America: | | | | |
| Canada | 11,169,056 | 11,409,746 | 13,762,062 | 14,183,051 |
| Central America: | | | | |
| Costa Rica | 147 | 50 | 665 | 135 |
| Guatemala | 229 | 3,208 | 406 | ---- |
| Honduras | 450 | 439 | 255 | 450 |
| Panama | 72 | 123 | 2,938 | 62 |
| Other | 116 | 183 | ---- | 28 |
| Mexico | 53,992 | 51,056 | 47,036 | 53,453 |
| Miquelon | 2,813 | 4,759 | 5,004 | 3,415 |
| West Indies: | | | | |
| British: | | | | |
| Bahamas | ---- | 3,042 | ---- | ---- |
| Bermuda | ---- | ---- | 404 | ---- |
| Jamaica | 25 | 68 | ---- | 30 |
| Trinidad and Tobago | 466 | 1,795 | 444 | 878 |
| Dominican Republic | 355 | ---- | ---- | 89 |
| French | 906 | 623 | 985 | 326 |
| Netherlands Antilles | ---- | 521 | 28 | ---- |
| Total | 11,228,627 | 11,475,613 | 13,820,227 | 14,241,917 |
| South America: | | | | |
| Argentina | 576,990 | 670,727 | 531,390 | 765,133 |
| Brazil | 978,700 | 1,316,150 | 1,155,806 | 1,101,308 |
| Chile | 177,999 | 114,126 | 180,193 | 183,783 |
| Uruguay | 33,972 | 57,779 | 47,684 | 47,333 |
| Venezuela | 16,970 | ---- | 18,151 | 83 |
| Other | 1,337 | 438 | ---- | 1,849 |
| Total | 1,785,968 | 2,159,220 | 1,933,224 | 2,099,489 |
| Europe: | | | | |
| Austria | 322,707 | 251,949 | 44,790 | 30,979 |
| Belgium-Luxembourg | 904,907 | 1,083,949 | 2,107,443 | 2,184,827 |
| Czechoslovakia | 39,617 | 13,761 | 76,718 | ---- |
| Denmark | 80,022 | 37,570 | 43,785 | 17,505 |
| France | 643,729 | 710,080 | 2,002,294 | 1,923,835 |
| Germany: | | | | |
| East | ---- | ---- | ---- | 267,921 |
| West | 4,203,520 | 4,812,249 | 5,508,144 | 5,161,464 |
| Greece | ---- | 57,554 | 70,563 | 35,151 |
| Ireland | 195,255 | 241,011 | 464,269 | 325,290 |
| Italy | 4,728,556 | 5,837,218 | 7,611,833 | 7,859,796 |
| Netherlands | 2,447,480 | 3,196,593 | 4,170,478 | 3,989,995 |
| Norway | 50,918 | 17,453 | 13,386 | 93,116 |
| Portugal | 67,046 | 125,398 | 229,095 | 162,941 |
| Spain | 227,574 | 766,095 | 1,405,748 | 1,406,607 |
| Sweden | 820,136 | 725,715 | 874,763 | 990,733 |
| Switzerland | 70,494 | ---- | 86,995 | 21,601 |
| Yugoslavia | 420,444 | 414,514 | 404,220 | 472,224 |
| Other | 51,970 | 2,501 | 103,247 | 151,850 |
| Total | 15,274,375 | 18,283,610 | 25,217,771 | 25,096,865 |
| Asia: | | | | |
| Indonesia | 1,079 | ---- | 11,107 | ---- |
| Japan | 6,610,166 | 6,465,395 | 6,052,859 | 6,514,724 |
| Other | 6,200 | 1,763 | 336 | 68 |
| Total | 6,617,445 | 6,467,158 | 6,064,302 | 6,514,792 |
| Africa: | | | | |
| Libya | 45,432 | 16,408 | 10,405 | 51 |
| United Arab Republic (Egypt) | 17,815 | 11,362 | 11,233 | 12,259 |
| Other | 55 | ---- | 21,273 | 5,050 |
| Total | 63,302 | 27,770 | 42,911 | 17,360 |
| Oceania: Australia | 108 | ---- | ---- | ---- |
| Grand total | 34,969,825 | 38,413,371 | 47,078,435 | 47,969,423 |

[1] Amounts stated do not include fuel or bunker coal loaded on vessels engaged in foreign trade, which aggregated 275,017 tons in 1961, 213,161 tons in 1962, 223,142 tons in 1963, and 252,785 tons in 1964.

Source: Bureau of the Census.

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**TABLE 77.—Bituminous coal exported from the United States, by customs districts**

(Net tons)

| Customs district | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|
| North Atlantic: | | | | |
| Maine and New Hampshire | 2,459 | 3,224 | 1,934 | 810 |
| Massachusetts | | 187 | | |
| New York | 5,448 | 23,300 | 2,645 | 155 |
| Philadelphia | 14,900 | 41,048 | 215,845 | 68,382 |
| Rhode Island | | | | 2,617 |
| South Atlantic: | | | | |
| Maryland | 1,160,824 | 2,119,628 | 3,477,457 | 3,257,925 |
| Virginia | 22,644,561 | 24,883,469 | 29,675,818 | 30,531,995 |
| Gulf Coast: | | | | |
| Galveston | 1,092 | 316 | 1,455 | 3,879 |
| Mobile | 30,086 | | 127 | 484 |
| New Orleans | 1,277 | 1,151 | 12,304 | 767 |
| Mexican border: | | | | |
| Arizona | | 61 | 56 | |
| El Paso | 55,353 | 49,022 | 36,303 | 48,636 |
| Laredo | 417 | 1,841 | 3,215 | 4,406 |
| Pacific Coast: | | | | |
| Los Angeles | | | | 1,260 |
| San Francisco | 81 | 30 | 236 | |
| Washington | 820 | 1,186 | | 500 |
| Northern border: | | | | |
| Buffalo | 148,542 | 150,701 | 160,215 | 126,300 |
| Chicago | 33,079 | 10,821 | 41,056 | 16,388 |
| Dakota | 9,544 | 7,721 | 7,101 | 3,997 |
| Duluth and Superior | 6,516 | 22,482 | 2,510 | 5,100 |
| Indiana | 4,822 | 4,777 | | |
| Michigan | 271,739 | 259,223 | 184,224 | 135,102 |
| Minnesota | | | 212 | |
| Montana and Idaho | 1,921 | 2,282 | 2,095 | 2,310 |
| Ohio | 9,061,261 | 9,096,160 | 10,338,842 | 11,941,491 |
| Rochester | 1,207,334 | 1,493,491 | 2,758,490 | 1,607,481 |
| St. Lawrence | 298,277 | 240,901 | 148,613 | 209,438 |
| Vermont | 141 | 235 | 7,462 | |
| Wisconsin | 42 | | | |
| Miscellaneous: | | | | |
| Alaska | | 84 | | |
| Kentucky | | 30 | | |
| Connecticut | | | 220 | |
| St. Louis | 9,289 | | | |
| Total | 34,969,825 | 38,413,371 | 47,078,435 | 47,969,423 |

Source: Bureau of the Census.

**TABLE 78.—Shipments of bituminous coal to possessions and other areas administered by the United States**

(Net tons)

| Territory | 1962 | 1963 | 1964 |
|---|---|---|---|
| Guam | 3 | 12 | 89 |
| Puerto Rico | 2,264 | 1,979 | 1,710 |
| Virgin Islands | 11 | 18 | 5 |

Source: Bureau of the Census.

## WORLD PRODUCTION

The United States supplied 504 million tons of bituminous coal, anthracite, and lignite, or 17 percent of the world output, in 1964.

World coal output increased 4 percent, principally in the United States and Europe.

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**TABLE 79.—World production of bituminous coal, anthracite, and lignite by countries [1]**

(Thousand short tons)

| Country | 1960 | 1961 | 1962 | 1963 | 1964 p |
|---|---|---|---|---|---|
| **North America:** | | | | | |
| Canada: | | | | | |
| Bituminous | 8,840 | 8,189 | 8,028 | 8,702 | 9,325 |
| Lignite | 2,171 | 2,209 | 2,256 | 1,874 | 1,994 |
| Greenland: Bituminous | 31 | 35 | 29 | 44 | 26 |
| Mexico: Bituminous | 1,958 | 2,004 | 2,087 | 2,283 | 2,357 |
| United States: | | | | | |
| Anthracite (Pennsylvania) | 18,817 | 17,446 | 16,894 | 18,267 | 17,184 |
| Bituminous | 412,766 | 399,959 | 419,094 | 456,223 | 484,048 |
| Lignite | 2,746 | 3,018 | 3,055 | 2,705 | 2,950 |
| Total | 447,329 | 432,860 | 451,443 | 490,098 | 517,884 |
| **South America:** | | | | | |
| Argentina: Bituminous | 309 | 379 | 315 | 226 | 366 |
| Brazil: Bituminous (including lignite) | 2,568 | 2,635 | 2,765 | 2,834 | 3,578 |
| Chile: Bituminous (mined) | 1,621 | 1,944 | 2,045 | 1,895 | 1,972 |
| Colombia: Bituminous | 2,866 | 3,086 | 3,307 | 3,527 | 3,307 |
| Peru: Bituminous and anthracite | 179 | 184 | 180 | 144 | 161 |
| Venezuela: Bituminous | 39 | 34 | 30 | 46 | 42 |
| Total | 7,582 | 8,262 | 8,642 | 8,674 | 9,426 |
| **Europe:** | | | | | |
| Albania: Lignite | 320 | 319 | 342 | e 331 | e 331 |
| Austria: | | | | | |
| Bituminous | 146 | 117 | 109 | 115 | 114 |
| Lignite | 6,584 | 6,240 | 6,296 | 6,672 | 6,350 |
| Belgium: Bituminous and anthracite | 24,763 | 23,739 | 23,398 | 23,609 | 23,495 |
| Bulgaria: | | | | | |
| Bituminous and anthracite | 628 | 651 | 701 | 725 | 670 |
| Lignite | 18,273 | 19,890 | 22,669 | 22,349 | 26,147 |
| Czechoslovakia: | | | | | |
| Bituminous | 28,896 | 28,917 | 29,927 | 31,191 | 31,087 |
| Lignite | 64,378 | 71,984 | 76,594 | 80,803 | 83,340 |
| Denmark: Lignite | 2,545 | 2,384 | 2,232 | 2,204 | e 2,094 |
| France: | | | | | |
| Bituminous and anthracite | 61,692 | 57,715 | 57,728 | 52,649 | 58,455 |
| Lignite | 2,512 | 3,203 | 3,177 | 2,724 | 2,470 |
| Germany: | | | | | |
| Bituminous and anthracite: | | | | | |
| East | 2,999 | 2,944 | 2,838 | 2,737 | e 2,756 |
| West (including Saar) | 157,911 | 158,309 | 156,417 | 156,656 | 156,750 |
| Lignite: | | | | | |
| East | 248,532 | 261,166 | 272,262 | 280,428 | 283,073 |
| West | 105,974 | 107,140 | 111,610 | 117,569 | 122,256 |
| Pech coal: West | 2,021 | 1,943 | 1,942 | 2,029 | 2,060 |
| Greece: Lignite | 2,747 | 2,760 | 2,971 | 3,836 | 4,193 |
| Hungary: | | | | | |
| Bituminous | 3,138 | 3,385 | 3,685 | 4,091 | 4,547 |
| Lignite | 26,098 | 27,672 | 27,901 | 29,404 | 30,229 |
| Ireland: Bituminous and anthracite | 229 | 222 | 229 | 230 | 255 |
| Italy: | | | | | |
| Bituminous and anthracite | 812 | 818 | 763 | 645 | 520 |
| Lignite | 875 | 1,681 | 1,958 | 1,506 | 1,324 |
| Netherlands: | | | | | |
| Bituminous and anthracite | 13,777 | 13,912 | 12,757 | 12,686 | 12,655 |
| Lignite | 4 | | | | |
| Poland: | | | | | |
| Bituminous | 115,123 | 117,513 | 120,818 | 124,726 | 129,360 |
| Lignite | 10,281 | 11,396 | 12,226 | 16,914 | 22,355 |
| Portugal: | | | | | |
| Anthracite | 480 | 518 | 446 | 459 | 489 |
| Lignite | 172 | 174 | 169 | 157 | 112 |
| Rumania: [2] | | | | | |
| Bituminous and anthracite [3] | 4,939 | 5,404 | 5,863 | 6,234 | e 7,301 |
| Lignite | 4,059 | 4,190 | 4,707 | 5,084 | e 4,960 |
| Spain: | | | | | |
| Bituminous and anthracite | 15,193 | 15,207 | 13,994 | 14,229 | 13,346 |
| Lignite | 1,942 | 2,303 | 2,743 | 2,856 | 2,838 |
| Svalbard (Spitzbergen): Bituminous: | | | | | |
| Controlled by Norway | 445 | 407 | 489 | 433 | 488 |
| Controlled by U.S.S.R. | 529 | 439 | 405 | 408 | e 661 |
| Sweden: Bituminous | 277 | 220 | 163 | 110 | 91 |
| U.S.S.R.: [4] | | | | | |
| Bituminous and anthracite | 413,284 | 415,592 | 425,933 | 435,555 | 451,952 |
| Lignite | 152,406 | 147,176 | 144,403 | 150,565 | 158,733 |
| United Kingdom: Bituminous and anthracite | 216,838 | 213,320 | 221,129 | 219,291 | 216,963 |

See footnotes at end of table.

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**TABLE 79.—World production of bituminous coal, anthracite, and lignite by countries [1]—Continued**

(Thousand short tons)

| Country | 1960 | 1961 | 1962 | 1963 | 1964 p |
|---|---|---|---|---|---|
| Yugoslavia: | | | | | |
| Bituminous | 1,414 | 1,447 | 1,310 | 1,418 | 1,444 |
| Lignite | 23,623 | 25,089 | 25,910 | 28,810 | 31,139 |
| Total [4] | 1,736,859 | 1,757,506 | 1,799,214 | 1,842,438 | 1,897,333 |
| Asia: | | | | | |
| Afghanistan: Bituminous | 51 | 76 | e 74 | 108 | 125 |
| Burma: Bituminous | 1 | 2 | 3 | e 6 | e 9 |
| China: Bituminous, anthracite, and lignite | 460,000 | 275,000 | 275,000 | 300,000 | e 320,000 |
| India: | | | | | |
| Bituminous | 57,974 | 61,801 | 67,649 | 72,652 | 68,810 |
| Lignite | 52 | 71 | 233 | 1,093 | 1,729 |
| Indonesia: Bituminous | 725 | 619 | 519 | 651 | 491 |
| Iran: Bituminous [5] | 254 | 220 | 220 | e 220 | e 220 |
| Japan: | | | | | |
| Bituminous and anthracite | 56,292 | 60,058 | 59,965 | 56,810 | 55,517 |
| Lignite | 1,552 | 1,443 | 1,225 | 1,007 | 761 |
| Korea: | | | | | |
| North: Anthracite, bituminous, and lignite | 11,707 | 12,996 | 14,550 | 15,472 | 17,081 |
| South: Anthracite | 5,897 | 6,486 | 8,206 | 9,763 | 10,604 |
| Malaya: Bituminous | 8 | | | | |
| Mongolia, Outer: Lignite and bituminous | 682 | 826 | 948 | 931 | e 780 |
| Pakistan: Bituminous and lignite | 916 | 1,015 | 1,097 | 1,370 | 1,338 |
| Philippines: Bituminous | 163 | 168 | 180 | 173 | 127 |
| Taiwan: Bituminous | 4,367 | 4,670 | 5,020 | 5,301 | 5,541 |
| Thailand: Lignite | 164 | 119 | 149 | 151 | 114 |
| Turkey (mined): | | | | | |
| Bituminous | 6,952 | 7,035 | 7,156 | 7,494 | 7,868 |
| Lignite | 3,760 | 4,159 | 4,668 | 5,501 | 6,367 |
| Viet-Nam: | | | | | |
| North: Anthracite | 2,860 | 3,099 | 3,823 | 3,714 | e 4,000 |
| South: Anthracite | 30 | 63 | 78 | 115 | 164 |
| Total [4] | 614,407 | 439,926 | 450,763 | 482,532 | 501,646 |
| Africa: | | | | | |
| Algeria: Bituminous and anthracite | 131 | 86 | 58 | 44 | 39 |
| Congo, Republic of the (Léopoldville): Bituminous | 180 | 80 | 84 | 101 | 110 |
| Malagasy, Republic of: Bituminous | | 2 | | 2 | (6) |
| Morocco: Anthracite | 454 | 452 | 408 | 445 | 441 |
| Mozambique: Bituminous | 298 | 354 | 328 | 312 | 270 |
| Nigeria: Bituminous | 629 | 669 | 699 | 636 | 770 |
| Rhodesia (formerly Southern): Bituminous | 3,923 | 3,387 | 3,115 | 3,020 | 3,355 |
| South Africa, Republic of: Bituminous and anthracite (marketable) | 42,079 | 43,613 | 45,498 | 46,798 | 49,513 |
| Swaziland: Anthracite and bituminous | 13 | 1 | | | (6) |
| Tanzania: Bituminous | 2 | 2 | 3 | 2 | 1 |
| Total | 47,709 | 48,646 | 50,193 | 51,360 | 54,499 |
| Oceania: | | | | | |
| Australia: | | | | | |
| Bituminous | 25,277 | 26,886 | 27,406 | 27,832 | 30,638 |
| Lignite | 16,763 | 18,232 | 19,191 | 20,666 | 21,311 |
| New Zealand: | | | | | |
| Bituminous and anthracite | 3,194 | 3,101 | 2,689 | 2,889 | 3,046 |
| Lignite | 180 | 175 | 166 | 181 | 175 |
| Total | 45,414 | 48,394 | 49,452 | 51,568 | 55,170 |
| Lignite (total of items shown above) (estimate) | 699,395 | 725,019 | 750,061 | 786,321 | 818,165 |
| Bituminous and anthracite (by subtraction) | 2,199,905 | 2,010,575 | 2,059,646 | 2,140,349 | 2,217,793 |
| World total, all grades (estimate) | 2,899,300 | 2,735,594 | 2,809,707 | 2,926,670 | 3,035,958 |

e Estimate. p Preliminary.

[1] This table incorporates some revisions.

[2] Revised according to the new standard of the United Nations "International Classification of Hard Coals by Type."

[3] Includes a preponderant share of low-grade bituminous.

[4] Output from U.S.S.R. in Asia (including Sakhalin) included with U.S.S.R. in Europe.

[5] Year ended March 20 of year following that stated.

[6] Less than ½ unit.

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## ECONOMIC AND TECHNICAL DEVELOPMENTS

For the bituminous coal industry, 1964 was a rewarding year. The increase in coal production for the third consecutive year was brought about by several factors. In addition to the increased demand for coal-generated electrical energy, there were continuing technical achievements in mining, preparation and transportation. The overall confidence of the industry is reflected in the fact that approximately $800 million was spent for improving and building new mining facilities and equipment, and for operating and maintenance supplies. Thus, the vigor of the industry was further demonstrated by the addition of still more efficient equipment for recovering coal at both underground and surface mines. An example of the better competitive status of coal as an energy source is the fact that coal has made further inroads in market areas, such as Florida, that were once the exclusive domain of other fuels. Industry leaders are devoting considerable effort to finding solutions to the dual problems of air and water pollution. Strip mine operators placed greater emphasis during the year on reclaiming mined surface areas.

In underground mining, two new types of continuous miners were introduced and several improvements were made in existing types of miners. One of the new miners was a two-arm rotary drum machine which can drive 18-foot places in 36- to 58-inch seams. This machine occupies about one-third of the entry width, thus allowing considerable room for ventilation and roof control. The second newly introduced miner has an oscillating ripper designed for use in 50- to 120-inch seams. This miner can cut a 10-foot place in a single downward pass. A crawler-mounted continuous miner was introduced for use in seams as low as 30 inches, which was a needed complement to low coal equipment. With these and other improvements, high production rates become more common than previously. Tonnages produced heretofore on peak shifts became average due to greatly reduced maintenance requirements. Continued success with the remote-control push button miner in Ohio confirms the practicality of this system, as a result of which additional installations may be forthcoming. New face haulage equipment was introduced, which, when used with modern mining machines, holds promise of increasing productivity even further. One of the new haulage systems, called a mobile bridge conveyor, can move more than 450 tons per hour from the face with increased safety for the workers. Battery-powered rubber-tired haulage units gained wider acceptance. These units permit high recovery rates when used in conjunction with newer models of low seam mining equipment.

High interest was shown in longwall mining. Excellent experience in West Virginia, Pennsylvania, and Utah has proved that longwall mining is practical in the United States, at least in some areas. Operators indicate that when longwall methods were used under proper conditions, recovery increased over conventional mining methods, and roof support costs were lower. One mine reported a savings up to 34 cents per ton. Equipment manufacturers offered a wide range of longwall equipment. Successes with this mining technique during the year indicate that additional longwall mining units will be used in the future.

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The increasing size of mining equipment requires that higher electrical voltages be made available at the working face. Considerable progress was made toward getting permissible face voltage restrictions revised. The newly developed procedure for using a high-current silicon dioxide for frame grounding gained considerable acceptance. This grounding procedure eliminates the need for the three conductor system, thereby effecting considerable economy. Increasing interest was shown in using diesel-powered shuttle cars where no trailing cables are required. The successful application of diesel cars in eastern Kentucky, where maintenance supply costs were reported much lower than for electric cars, may be indicative of a trend to widespread use of diesel cars in coal mines.

The initial progress made with using computers to evaluate mining operations made the industry aware of the potential importance of this technique. This work was started in 1962 by Virginia Polytechnic Institute under contract with the Office of Coal Research. A mine in Alabama used the computer program developed by V.P.I. Very favorable results were obtained. Probably as a result of this program, several mine operators are using time and motion studies to gain imformation regarding face and haulage cycles. This development, while slow in coming, should contribute greatly to increased productivity and lower costs.

In surface mining, as in the past several years, the emphasis was on larger and more efficient earth moving equipment. Active shovel capacity reached a new high when a 140 cubic yard shovel went into operation in southern Illinois. This machine's power requirements are equal to that of an average town of 15,000 inhabitants, and is capable of moving 210 tons of overburden in 45 to 55 seconds. This record will be short lived, however. A 200 cubic yard shovel which has been under construction for more than a year is expected to go into operation in the near future. A second 85 cubic yard dragline began moving overburden. A 3,500 hp. wheel-excavator capable of handling 2,800 cubic yards of overburden per hour is nearly completed and is scheduled to start uncovering lignite in North Dakota. This excavating wheel will be the largest in the lignite fields of the United States. A self-propelled stacker capable of moving 350 cubic yards per hour to a point nearly 100 feet away and 35 feet high went into operation. This stacker has performed at rates as high as 475 cubic yards per hour.

In addition to the large earth-moving equipment, economies in surface mining also have been achieved by less spectacular means. A specially designed 5 cubic yard, fast cycle, shovel went into operation. This shovel, designed to remove partings in a multiple-bedded stripping area, compares favorably in performance with large draglines, yet has a much lower initial cost. Larger sized rotary drills were employed to prepare holes for explosives used to loosen the overburden for the large earth-moving equipment. The larger drill holes permit a greater explosive charge to be used, which in turn permits more overburden to be loosened with each charge. Trucks used to haul coal from surface mines have been getting larger; 120-ton capacity trucks already have been accepted. A new coal-hauling truck with a capacity of 240 tons has been designed and construction is nearly completed. This truck has dual controls so that it may be driven from either end. In spite of its great length, 96 feet, it has a turning

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radius of approximately 42 feet. In addition to land reclamation projects, strip mine operators sought to improve public relations by reducing noise and vibrations near populated areas. Major reclamation efforts were devoted to reforestation and planning recreational facilities.

Chief developments in coal preparation were the introduction of better designed equipment with superior performance and greater economy. Automation achieves better quality control with less manpower and at a lower overall cost. There was increased use of froth flotation and thermal drying equipment, the chief purpose being for water clarification as well as coal recovery.

The revolution in coal transportation is well under way. In overland transportation there was a significant extension of the unit train concept. It is estimated that approximately 100 million tons of coal were moved by unit trains in 1964. The trend to the use of larger hopper cars in unit trains continued. One company is reported to have requested that a 240-ton capacity, all aluminum hopper car be designed and tested. A new 4,320 hp. diesel-powered towboat is being designed for hauling coal barges on the Mississippi River. Just south of New Orleans, a river-to-ocean shipping transfer station is under construction. This transfer station will be used primarily as an aid in getting midwestern coal to Florida markets. In connection with this, the longest dry cargo barge ever built made its maiden voyage, hauling 17,000 tons of midwestern coal from the new transfer station to Tampa, Fla., for use in an electric utility plant. The barge returned to New Orleans laden with phosphate rock. This closed-circuit operation lowers the delivered cost of both the coal and phosphate rock. In ocean transportation the use of supercolliers is increasing. One supercollier bound for Japan, loaded at Hampton Roads, Va., with 56,200 tons of high-grade metallurgical coal, set a new record for coal tonnage. The multimillion dollar port facilities at Hampton Roads, Va., had an outstanding year of operation. During 1964, approximately 26 million tons of coal flowed through these facilities. Of this amount, nearly 21 million tons were destined for overseas ports. France announced late in the year that she would construct a large supercollier capable of hauling more than 80,000 tons of coal. Other coal importing nations have expressed an interest in supercolliers of this class. Thus there is reason to believe that the trend to larger supercolliers will continue. The net result of the technical improvements in both overland and ocean transportation was that transportation rates were lowered considerably. With the use of unit trains and long-term coal contracts, freight rates were lowered by as much as $1.75 to $2 per ton in some instances. Large supercolliers plying the trade routes loaded with coal have caused ocean freight rates to be lowered by as much as $2 a ton on coal going to Japan and $1 a ton on coal going to Europe.

Electric utilities have become coal's biggest market. Twenty-four steam electric generating units presently under construction or scheduled for service by the end of 1968 will burn coal. Many of these units will be mine-mouth generating facilities. Extra high-voltage networks are planned as an integral part of some of the generating stations now under construction. Meanwhile, electric rate reductions

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were put into effect as a result of the savings brought about by the lower delivered price of coal.

Strong research programs carried out by the coal industry as well as by Federal and State governments were responsible for several significant developments. Three processes were developed for removing $SO_2$ from stack gases. One of these processes recovers elemental sulfur, whereas the other two convert the $SO_2$ to sulfuric acid. A moisture meter was developed which provides continuous measurement of the moisture content of coal. This may prove quite useful in automatically controlled preparation plants. Coal-burning gas turbines were one step closer to reality after a testing program indicated that specially designed rotor and stator blades resisted erosion considerably better than the blades formerly used. An experimental blast furnace was put into operation designed for the highest pressures used for iron making in this country. This furnace will help determine the value of coal as an auxiliary fuel in blast furnaces. The use of coal as a water purifier either before or after it is burned was found promising. A durable, lightweight brick was made from a mixture of fly ash, sand, and sodium silicate which is not only attractive but can be produced economically. The bricks produced met or surpassed A.S.T.M. standards established for clay bricks. As the result of a research contract, the first packaged boiler went into operation. Several more of these units are expected to be in service shortly. A one cylinder diesel engine running on pulverized coal was demonstrated. The engine was first started on oil, then powdered coal was introduced and the oil flow was stopped. The engine continued to run on pulverized coal. A direct titration method of determining the sulfur content of coal was developed which results in a savings of analysis time and labor.

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# Coal—Pennsylvania Anthracite

By J. A. Vaughan [1] and Marian I. Cooke [2]

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## GENERAL SUMMARY

PRODUCTION of Pennsylvania anthracite totaled 17.2 million short, or net, tons in 1964, a decrease of 6 percent from 1963. Of this total, 34 percent was produced at underground mines, 42 percent at strip pits, 20 percent from culm and silt banks, and 4 percent from river dredging. When compared with tonnages produced in 1963, underground production declined 12 percent, strip pits 4 percent, dredging operations increased 2 percent, and culm and silt banks remained about the same—increasing less than 1 percent.

Total value of the 1964 output was $148.6 million, 3 percent less than in 1963. Production of pea and larger sizes declined 10 percent from 1963 and the buckwheat No. 1 and smaller category, 3 percent. Although the pea and larger sizes amounted to only 39 percent of the year's output (41 percent in 1963), they accounted for relatively more of the industry's total revenue than in 1963 because of the higher prices received. The average value for pea and larger was $12.38 per net ton f.o.b. preparation plant, a gain of $0.73, or 6 percent, while the average for the buckwheats was $6.34, a gain of $0.09 per ton, or 1 percent. Except for the "Other" category, each size commanded higher prices. As a result, the average value for all sizes increased to $8.70—$0.25 more than in 1963.

Apparent consumption of anthracite in the United States during 1964 was estimated at 14.4 million tons, a gain of 2 percent. Although use data are incomplete for anthracite, the slight increase in apparent consumption indicated an increased demand for the smaller industrial sizes.

[1] Mineral specialist (coal).
[2] Statistical officer.



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Exports of anthracite totaled 1.6 million tons, a decrease of 53 percent from the 3.6 million tons shipped to foreign countries in 1963. The greater part of the decrease was attributable to the trade with Western Europe, which dropped 66 percent. However, a more accurate measurement of the importance of exports to the industry can be obtained by adding the quantity shipped for use by the U.S. Armed Forces in West Germany to the tonnage reported by the Bureau of the Census. This computation indicates that approximately 2,736,000 tons were actually exported, or about 16 percent of the total 1964 production.

Although production declined 6 percent, the average number of men working daily at anthracite operations in 1964 fell only 3 percent to a total of 13,144. Anthracite operations were active on an average of 214 days, a decrease of 2 days from 1963. However, owing to the reduction in the number of days worked and men working, actual worktime declined to 2,812,000 man-days, or 3 percent below 1963. The productivity rate also declined—from 6.27 tons per man-day in 1963 to 6.11 tons in 1964.

A new wage contract between the producing companies and the United Mine Workers of America became effective September 1, 1964. The package agreement included wage increases, a larger payment for lunch periods, a $25 increase in vacation pay (to a total of $185), and three paid holidays: May 30 (Memorial Day), Thanksgiving Day, and Christmas. April 1 (8-hour day) also will be an idle day. A new seniority clause and other provisions affecting mine safety and the Anthracite Health and Welfare Fund were also embodied in the new agreement.

The overall injury rate in the industry increased to 67.07 per million man-hours, compared with 63.05 in 1963. A total of 24 men lost their lives at anthracite operations (32 in 1963), at a frequency rate of 1.18 per million man-hours (1.52 in 1963). Nonfatal injuries totaled 1,342 durnig the year, compared with 1,295 in 1963; the rate increased from 61.53 in 1963 to 67.07 in 1964.

Table 1 includes salient annual statistics for 1960–64; monthly developments in the industry in 1964 are shown in table 2. Table 3 shows selected historical data for 1930–64.

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**TABLE 1.—Salient statistics of the Pennsylvania anthracite industry, 1960–64**

| | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Production: | | | | | |
| Preparation plants—net tons | 18,003,730 | 16,655,847 | 16,015,366 | 17,415,365 | 16,335,700 |
| Dredges—do | 711,713 | 745,498 | 726,666 | 691,370 | 704,748 |
| Used at collieries for power and heat—net tons | 101,998 | 45,094 | 151,614 | 160,649 | 143,803 |
| Total production—do | 18,817,441 | 17,446,439 | 16,893,646 | 18,267,384 | 17,184,251 |
| Value of production | $147,116,250 | $140,337,541 | $134,093,874 | $153,503,442 | $148,647,575 |
| Average sales realization per net ton on preparation plant shipments (excludes dredge coal) | | | | | |
| Pea and larger | $10.42 | $10.80 | $10.90 | $11.65 | $12.38 |
| Buckwheat No. 1 and smaller | $6.27 | $6.32 | $6.14 | $6.43 | $6.56 |
| All sizes | $8.01 | $8.26 | $7.99 | $8.64 | $8.93 |
| Percentage of total preparation plant shipments (excludes dredge coal) | | | | | |
| Pea and larger | 42.0 | 43.4 | 43.1 | 42.4 | 40.8 |
| Buckwheat No. 1 and smaller | 58.0 | 56.6 | 56.9 | 57.6 | 59.2 |
| Producers' stocks at end of year [1] net tons | 199,356 | 232,520 | (2) | (2) | (2) |
| Exports [3]—do | 1,440,400 | 1,435,335 | 1,801,724 | r 3,357,340 | 1,575,097 |
| Imports [3]—do | 1,476 | 792 | 7,583 | [4] 4,625 | NA |
| Consumption (apparent)—do | 17,600,000 | 15,900,000 | 14,300,000 | r 14,100,000 | 14,400,000 |
| Average number of days worked | 176 | 196 | 204 | 216 | 214 |
| Average number of men working daily | 19,051 | 15,792 | 14,010 | 13,498 | 13,144 |
| Output per man per day—net tons | 5.60 | 5.63 | 5.92 | 6.27 | 6.11 |
| Output per man per year—do | 986 | 1,103 | 1,208 | 1,354 | 1,308 |
| Quantity cut by machines—do | 225,520 | 236,166 | 277,537 | 240,427 | 417,080 |
| Quantity mined by stripping—do | 7,112,288 | 7,246,646 | 6,822,207 | 7,467,842 | 7,177,188 |
| Quantity loaded by machines underground—net tons | 4,044,392 | 3,377,778 | 3,065,364 | 3,665,962 | 3,455,034 |
| Distribution: | | | | | |
| Receipts in New England [5]—do | 697,353 | 634,435 | 495,390 | 422,012 | 331,780 |
| Exports to Canada [3]—do | 1,204,414 | 965,576 | 892,488 | 794,585 | 636,867 |
| Loaded into vessels at Lake Erie [6] net tons | 244,468 | 221,435 | 196,440 | 191,609 | 216,590 |
| Receipts at Duluth-Superior [7] do | 65,713 | 33,474 | 26,516 | r 32,615 | 47,649 |

r Revised. NA Not available.
[1] Anthracite Committee.
[2] This series discontinued.
[3] U.S. Department of Commerce, 1961–64 export data does not include shipments to U.S. military forces. See NOTE, tables 2 and 34.
[4] Import data discontinued with August 1963.
[5] Commonwealth of Massachusetts, Division on the Necessaries of Life.
[6] Ore and Coal Exchange, Cleveland, Ohio.
[7] Lake Superior Area Office, Corps of Engineers, U.S. Army, Duluth, Minn.

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TABLE 2.—Statistical summary of monthly developments

(Net tons, except as

| | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Production (including mine fuel, local sales, and dredge coal) | 1,668,000 | 1,520,000 | 1,211,000 | 1,454,000 | 1,636,000 | 1,816,000 |
| Shipments (breakers and washeries only, all sizes): | | | | | | |
| By rail [1] | 717,743 | 652,738 | 527,701 | 673,068 | 778,745 | 919,424 |
| By truck [2] | 873,834 | 785,719 | 627,555 | 656 380 | 599,553 | 624,000 |
| Carloadings [3] | 14,048 | 12,254 | 11,034 | 13,226 | 14,891 | 17,442 |
| Distribution: | | | | | | |
| Lake Erie loadings [4] | ---------- | ---------- | ---------- | 19,904 | 18,969 | 19,229 |
| Lake Ontario loadings [4] | ---------- | ---------- | ---------- | ---------- | ---------- | 4,365 |
| Receipts at Duluth-Superior [5] | ---------- | ---------- | ---------- | ---------- | 2,527 | 10,007 |
| Upper Lake dock trade: [6] | | | | | | |
| Receipts: | | | | | | |
| Lake Superior | ---------- | ---------- | ---------- | ---------- | 142 | 5,079 |
| Lake Michigan | 655 | 516 | 816 | 5,605 | 2,179 | 489 |
| Deliveries (reloadings): | | | | | | |
| Lake Superior | 2,375 | 1,379 | 196 | 124 | 243 | 4,935 |
| Lake Michigan | 2,039 | 1,337 | 967 | 634 | 587 | 903 |
| New England receipts: By rail [7] | 32,030 | 31,553 | 14,531 | 18,549 | 39,540 | 47,910 |
| Exports [8] | 247,735 | 148,716 | 86,001 | 84,382 | 151,043 | 170,608 |
| Imports [9] | NA | NA | NA | NA | NA | NA |
| Industrial consumption and stocks by: | | | | | | |
| Electric utilities: [11] | | | | | | |
| Consumption | 182,991 | 182,831 | 173,803 | 187,092 | 195,660 | 186,092 |
| Stocks | 1,271,503 | 1,205,142 | 1,182,893 | 1,200,791 | 1,180,782 | 1,176,057 |
| Coke plants: | | | | | | |
| Used for carbonizing | 42,389 | 39,080 | 42,236 | 41,297 | 41,309 | 39,587 |
| Stocks | 82,485 | 67,204 | 42,176 | 36,583 | 42,782 | 58,768 |
| Stocks on Upper Lake docks: [6] | | | | | | |
| Lake Superior | 4,211 | 2,764 | 2,568 | 2,540 | 2,283 | 2,254 |
| Lake Michigan | 6,654 | 5,818 | 5,667 | 9,916 | 11,508 | 11,094 |
| Stocks in retail dealer yards: [12] | | | | | | |
| Chestnut and larger | 237,000 | 222,000 | 192,000 | 259,000 | 336,000 | 396,000 |
| Pea | 36,000 | 32,000 | 24,000 | 31,000 | 35,000 | 44,000 |
| Buckwheat No. 1 and rice | 176,000 | 153,000 | 119,000 | 130,000 | 173,000 | 245,000 |
| Total | 449,000 | 407,000 | 335,000 | 420,000 | 544,000 | 685,000 |
| Retail dealer deliveries: [12] | | | | | | |
| Chestnut and larger | 247,000 | 214,000 | 148,000 | 92,000 | 73,000 | 103,000 |
| Pea | 65,000 | 60,000 | 44,000 | 35,000 | 27,000 | 28,000 |
| Buckwheat No. 1 and rice | 139,000 | 110,000 | 93,000 | 68,000 | 68,000 | 109,000 |
| Total | 451,000 | 384,000 | 285,000 | 195,000 | 168,000 | 240,000 |
| Wholesale price indexes (1957–59=100): [13] F.o.b. mines: | | | | | | |
| Chestnut | 100.9 | 100.9 | 100.9 | 91.9 | 91.9 | 91.9 |
| Pea | 101.3 | 101.3 | 101.3 | 93.2 | 93.2 | 93.2 |
| Buckwheat No. 1 | 100.0 | 100.0 | 100.0 | 91.1 | 91.1 | 91.1 |
| Buckwheat No. 2 | 108.9 | 108.9 | 108.9 | 104.8 | 104.8 | 104.8 |

r Revised. NA Not available.
[1] Furnished by the initial carriers.
[2] Pennsylvania Department of Mines and Mineral Industries.
[3] Association of American Railroads.
[4] Ore and Coal Exchange, Cleveland, Ohio.
[5] Lake Superior Area Office, Corps of Engineers, U.S. Army, Duluth, Minn.
[6] Data supplied by Upper Lake Docks Coal Bureau, Inc., and direct reports to the Bureau of Mines.

NOTE.—According to the Association of American Railroads, 2,005,763 net tons of anthracite was exported West Germany, and 396,710 to Netherlands, including shipments for the use of U.S. military forces in West period in 1963.

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**in the Pennsylvania anthracite industry in 1964**

otherwise indicated)

| July | August | September | October | November | December | Year 1964 | Change from 1963 (percent) | Year 1963 |
|---|---|---|---|---|---|---|---|---|
| 1,182,000 | 1,306,000 | 1,300,000 | 1,337,000 | 1,340,000 | 1,414,000 | 17,184,000 | −5.9 | 18,267,000 |
| 636,453 | 841,875 | 756,673 | 743,534 | 659,923 | 616,856 | 8,824,753 | −19.6 | 10,599,400 |
| 446,671 | 591,221 | 631,814 | 627,051 | 587,023 | 810,736 | 7,861,857 | −1.4 | 7,970,106 |
| 13,682 | 16,141 | 14,685 | 13,811 | 12,666 | 12,141 | 166,021 | −17.2 | 200,540 |
| 28,661 | 18,204 | 28,752 | 42,217 | 40,654 | ---------- | 216,590 | +13.0 | 191,609 |
| ---------- | 734 | ---------- | ---------- | ---------- | ---------- | 5,149 | −79.0 | 24,480 |
| 2,824 | 2,448 | 10,086 | 17,500 | 2,557 | ---------- | 47,649 | +46.1 | 32,615 |
| 2,524 | 2,448 | 2,471 | 4,643 | 7,289 | ---------- | 24,596 | +32.2 | 18,605 |
| 110 | 1,102 | 466 | 289 | 450 | 414 | 13,091 | −38.7 | 21,360 |
| 2,365 | 2,423 | 2,544 | 5,967 | 5,028 | 2,121 | 29,700 | +21.5 | 24,446 |
| 1,143 | 1,199 | 1,034 | 1,679 | 1,299 | 1,538 | 14,359 | −37.0 | 22,792 |
| 26,222 | 21,867 | 23,710 | 26,787 | 24,099 | 24,982 | 331,780 | −21.4 | 422,012 |
| 157,859 | 141,705 | 127,955 | 120,433 | 77,793 | 60,867 | 1,575,097 | −53.1 | [9] 3,357,340 |
| NA | NA | NA | NA | NA | NA | NA | NA | [10] 4,625 |
| 201,429 | 193,236 | 194,159 | 186,771 | 165,446 | 180,809 | 2,229,319 | +4.7 | 2,130,286 |
| 1,155,752 | 1,193,441 | 1,234,194 | 1,278,347 | 1,289,658 | 1,247,238 | 1,247,238 | −3.6 | 1,294,129 |
| 42,799 | 35,351 | 41,551 | 43,351 | 41,685 | 41,683 | 492,318 | +9.3 | 450,509 |
| 60,035 | 67,531 | 82,882 | 103,198 | 132,546 | 129,342 | 129,342 | +13.8 | 113,620 |
| 2,372 | 2,397 | 2,399 | 1,084 | 3,253 | 1,132 | 1,132 | −82.8 | 6,586 |
| 10,061 | 9,964 | 9,396 | 8,006 | 7,157 | 6,033 | 6,033 | −23.7 | 7,911 |
| 407,000 | 408,000 | 395,000 | 360,000 | 338,000 | 306,000 | 306,000 | +8.1 | 283,000 |
| 47,000 | 46,000 | 45,000 | 42,000 | 39,000 | 37,000 | 37,000 | −7.5 | 40,000 |
| 232,000 | 254,000 | 265,000 | 262,000 | 260,000 | 243,000 | 243,000 | +14.1 | 213,000 |
| 686,000 | 708,000 | 705,000 | 664,000 | 637,000 | 586,000 | 586,000 | +9.3 | 536,000 |
| 100,000 | 121,000 | 147,000 | 213,000 | 165,000 | 231,000 | 1,854,000 | −11.2 | 2,088,000 |
| 16,000 | 19,000 | 22,000 | 34,000 | 26,000 | 45,000 | 421,000 | −21.7 | 538,000 |
| 126,000 | 77,000 | 56,000 | 59,000 | 56,000 | 98,000 | 1,059,000 | −25.9 | 1,429,000 |
| 242,000 | 217,000 | 225,000 | 306,000 | 247,000 | 374,000 | 3,334,000 | −17.8 | 4,055,000 |
| 95.4 | 95.4 | 95.4 | 96.9 | 96.9 | 96.9 | 96.8 | +4.1 | 93.0 |
| 97.5 | 97.5 | 97.5 | 99.7 | 99.7 | 99.7 | 97.9 | +2.7 | 95.3 |
| 92.9 | 92.9 | 92.9 | 95.2 | 95.2 | 95.2 | 94.8 | +.5 | 94.3 |
| 107.6 | 107.6 | 107.6 | 109.4 | 109.4 | 109.4 | 107.7 | +.1 | 107.6 |

[7] Furnished by Commonwealth of Massachusetts, Division on the Necessaries of Life.
[8] U.S. Department of Commerce. Export data does not include shipments to U.S. military forces.
[9] U.S. Department of Commerce. Beginning with the month of September, 1963 anthracite import data are included with bituminous coal.
[10] January–August total.
[11] Federal Power Commission.
[12] Estimated from reports submitted by a selected list of retail dealers located outside the producing region.
[13] Bureau of Labor Statistics. Based on data obtained from authorized trade publications.

to Europe during 1964 compared with 3,210,156 tons for 1963. Of this total, 965,479 tons was consigned to Germany. This compares with 860,800 tons to West Germany and 847,598 tons to Netherlands for the same

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## TABLE 3.—Trends in the Pennsylvania anthracite industry

| | Production (net tons) | Value of production | Average value per net ton | Exports [1] (net tons) | Imports [1] (net tons) | Apparent consumption [2] (net tons) | Average number of employees | Average number of days worked | Average tons per man per day | Average tons per man per year | Quantity cut by machines (net tons) | Quantity produced by stripping (net tons) | Quantity loaded mechanically underground (net tons) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1930 | 69,384,837 | $354,574,191 | $5.11 | 2,551,659 | 674,812 | 67,628,000 | 150,804 | 208 | 2.21 | 460 | 1,410,123 | 2,536,288 | 4,467,750 |
| 1931 | 59,645,652 | 296,354,586 | 4.97 | 1,778,308 | 637,951 | 58,406,000 | 139,431 | 181 | 2.37 | 428 | 1,587,265 | 3,813,237 | 4,384,780 |
| 1932 | 49,855,221 | 222,375,129 | 4.46 | 1,303,355 | 607,097 | 50,500,000 | 121,243 | 162 | 2.54 | 411 | 1,674,223 | 3,980,973 | 5,433,340 |
| 1933 | 49,541,344 | 206,718,405 | 4.17 | 1,034,562 | 456,252 | 49,600,000 | 104,633 | 182 | 2.60 | 473 | 1,648,249 | 4,932,069 | 6,557,267 |
| 1934 | 57,168,291 | 244,152,245 | 4.27 | 1,297,610 | 478,118 | 55,500,000 | 109,050 | 207 | 2.53 | 524 | 1,961,088 | 5,798,138 | 9,284,486 |
| 1935 | 52,158,783 | 210,130,565 | 4.03 | 1,608,549 | 571,439 | 51,100,000 | 103,269 | 189 | 2.68 | 505 | 1,848,095 | 5,187,072 | 9,279,057 |
| 1936 | 54,579,535 | 227,003,538 | 4.16 | 1,678,024 | 614,639 | 53,200,000 | 102,081 | 192 | 2.79 | 535 | 2,162,744 | 6,203,267 | 10,827,946 |
| 1937 | 51,856,433 | 197,598,849 | 3.81 | 1,914,173 | 395,737 | 50,400,000 | 99,085 | 189 | 2.77 | 523 | 1,984,512 | 5,696,018 | 10,683,837 |
| 1938 | 46,099,027 | 180,600,167 | 3.92 | 1,908,911 | 362,895 | 45,200,000 | 96,417 | 171 | 2.79 | 478 | 1,588,407 | 5,095,341 | 10,151,669 |
| 1939 | 51,487,377 | 187,175,324 | 3.64 | 2,590,000 | 298,153 | 49,700,000 | 93,138 | 183 | 3.02 | 553 | 1,881,884 | 5,486,479 | 11,773,833 |
| 1940 | 51,484,640 | 205,489,814 | 3.99 | 2,667,632 | 135,436 | 49,000,000 | 91,313 | 186 | 3.02 | 562 | 1,816,483 | 6,352,700 | 12,326,000 |
| 1941 | [3] 56,368,267 | 240,275,126 | 4.26 | 3,380,189 | 74,669 | 52,700,000 | 88,054 | 203 | [4] 3.04 | [4] 617 | 1,855,422 | 7,316,574 | 13,441,987 |
| 1942 | [3] 60,327,729 | 271,673,380 | 4.50 | 4,438,588 | 140,115 | 56,500,000 | 82,121 | 239 | [4] 2.95 | [4] 705 | 2,285,640 | 9,070,933 | 14,741,459 |
| 1943 | [3] 60,643,620 | 306,816,018 | 5.06 | 4,138,680 | 166,020 | 57,100,000 | 79,153 | 270 | [4] 2.78 | [4] 751 | 1,624,883 | 8,989,387 | 14,745,793 |
| 1944 | [3] 63,701,363 | 354,582,884 | 5.57 | 4,185,933 | 11,847 | 59,400,000 | 77,591 | 292 | [4] 2.79 | [4] 815 | 1,336,082 | 10,953,030 | 14,975,146 |
| 1945 | [3] 54,933,909 | 323,944,435 | 5.90 | 3,691,247 | 149 | 51,600,000 | 72,842 | 269 | [4] 2.79 | [4] 751 | 1,210,171 | 10,056,325 | 13,927,955 |
| 1946 | [3] 60,506,873 | 413,417,070 | 6.83 | 6,497,245 | 9,556 | 53,900,000 | 78,145 | 271 | [4] 2.84 | [4] 770 | 1,232,828 | 12,858,930 | 15,619,162 |
| 1947 | [3] 57,190,009 | 413,019,486 | 7.22 | 8,509,995 | 10,350 | 48,200,000 | 78,600 | 259 | [4] 2.78 | [4] 720 | 1,209,983 | 12,603,545 | 16,054,011 |
| 1948 | [3] 57,139,948 | 467,051,800 | 8.17 | 6,675,914 | 945 | 50,200,000 | 76,215 | 265 | [4] 2.81 | [4] 745 | 1,016,757 | 13,352,874 | 15,742,368 |
| 1949 | [3] 42,701,724 | 358,008,451 | 8.38 | 4,942,670 | -------- | 37,700,000 | 75,377 | 195 | [4] 2.87 | [4] 560 | 557,599 | 10,376,808 | 11,858,088 |
| 1950 | [3] 44,076,703 | 392,398,006 | 8.90 | 3,891,569 | 18,289 | 39,900,000 | 72,624 | 211 | [4] 2.83 | [4] 597 | 611,734 | 11,833,934 | 12,335,650 |
| 1951 [5] | 42,669,997 | 405,817,963 | 9.51 | 5,955,535 | 26,812 | 37,000,000 | 68,995 | 208 | 2.97 | 618 | 496,085 | 11,135,990 | 10,847,787 |
| 1952 | 40,582,558 | 379,714,076 | 9.36 | 4,592,060 | 29,370 | 35,300,000 | 65,923 | 201 | 3.06 | 615 | 386,128 | 10,696,705 | 10,034,464 |
| 1953 | 30,949,152 | 299,139,687 | 9.67 | 2,724,270 | 31,443 | 28,000,000 | 57,862 | 163 | 3.28 | 535 | 318,699 | 8,606,482 | 6,838,769 |
| 1954 | 29,083,477 | 247,870,023 | 8.52 | 2,851,239 | 5,831 | 26,900,000 | 43,996 | 164 | 4.02 | 659 | 381,424 | 7,939,680 | 6,978,035 |
| 1955 | 26,204,554 | 206,096,662 | 7.86 | 3,152,313 | 170 | 23,600,000 | [e] 33,523 | [e] 197 | [e] 3.96 | [e] 780 | 393,932 | 7,703,907 | 6,660,939 |
| 1956 | 28,900,220 | 236,785,062 | 8.19 | 5,244,349 | 46 | 24,000,000 | 31,516 | 216 | 4.25 | 918 | 400,402 | 8,354,230 | 7,308,110 |
| 1957 | 25,338,321 | 227,753,802 | 8.99 | 4,331,785 | 1,138 | 20,800,000 | 30,825 | 196 | 4.18 | 819 | 292,307 | 7,543,157 | 6,657,479 |
| 1958 | 21,171,142 | 187,898,316 | 8.88 | 2,279,859 | 4,363 | 19,000,000 | 26,540 | 183 | 4.36 | 798 | 184,028 | 6,877,761 | 5,332,043 |
| 1959 | 20,649,286 | 172,319,913 | 8.35 | 1,787,558 | 2,633 | 18,800,000 | 23,294 | 173 | 5.12 | 886 | 260,502 | 7,096,343 | 4,700,542 |
| 1960 | 18,817,441 | 147,116,250 | 7.82 | 1,440,400 | 1,476 | 17,600,000 | 19,051 | 176 | 5.60 | 986 | 225,520 | 7,112,288 | 4,044,392 |
| 1961 | 17,446,439 | 140,337,541 | 8.04 | 1,435,335 | 792 | 15,900,000 | 15,792 | 196 | 5.63 | 1,103 | 236,166 | 7,246,646 | 3,377,778 |
| 1962 | 16,893,646 | 134,093,874 | 7.94 | 1,801,724 | 7,583 | 15,000,000 | 14,010 | 204 | 5.92 | 1,208 | 277,537 | 6,822,207 | 3,065,364 |
| 1963 | 18,267,384 | 153,503,442 | 8.40 | [e] 3,357,340 | [e] 4,625 | [r] 14,100,000 | 13,498 | 216 | 6.27 | 1,354 | 240,427 | 7,467,842 | 3,665,962 |
| 1964 | 17,184,251 | 148,647,575 | 8.65 | 1,575,097 | NA | 14,400,000 | 13,144 | 214 | 6.11 | 1,308 | 417,080 | 7,177,188 | 3,455,034 |

[e] Estimated. [r] Revised. NA Not available.

[1] U.S. Department of Commerce. Export data for 1961–64 does not include shipments to U.S. military forces. See NOTE, tables 2 and 34.

[2] After 1961 the figures of consumption take no account of producers' stocks, there being no data available for this item.

[3] Includes some bootleg coal purchased by authorized operators and prepared at their breakers.

[4] Output per man calculated on authorized tonnages only; bootleg purchases excluded.

[5] Figures for 1951 and subsequent years are not strictly comparable with previous years. See Production and Employment sections, Coal—Pennsylvania Anthracite, Minerals Yearbook, 1951.

[6] For period January–August. Beginning with September, anthracite import data is included with bituminous.

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## SCOPE OF REPORT

Data in this chapter refer only to anthracite, or hard coal, produced in the northeastern part of the Commonwealth of Pennsylvania. Production of anthracite, or semianthracitic coals of Arkansas, Colorado, New Mexico, Virginia, and Washington is included with bituminous coal and lignite in the Bituminous Coal and Lignite chapter of the Bureau of Mines Minerals Yearbook. The anthracite producing region is divided geologically into four fields: The Northern, Eastern Middle, Western Middle, and Southern. The area is also grouped by coaltrade usage into three regions: The Wyoming, which is coextensive with the Northern field; the Lehigh, which includes the Eastern Middle field and that portion of the Southern lying east of Tamaqua; and the Schuylkill, which encompasses all of the Western Middle field and that part of the Southern field west of Tamaqua.

Bureau statistics on production, value, and transportation methods are compiled almost entirely from reports submitted voluntarily by operators of preparation plants and dredges. Estimates are prepared on unreported tonnage from data published by the Pennsylvania Department of Mines and Mineral Industries and other sources. Questionnaires are also sent to operators of underground mines not equipped with preparation facilities and to contractors engaged either in strip mining or in reclaiming culm and silt banks. From these reports information is obtained on run-of-mine production, names of plants to which the raw coal is shipped for preparation, types of mining equipment used, and the counties, fields, and regions in which the run-of-mine production originated. These reports are used also to eliminate duplicate reporting and to obtain the widest possible coverage.

Beginning with calendar year 1961, Bureau production data have been presented by carrier method (rail and truck), rather than as shipments to points inside (local sales) and outside the producing region. Also, since 1956, statistics on employment in the Pennsylvania anthracite industry have been compiled from the Bureau of Mines questionnaire, Mine Injuries and Employment-Pennsylvania Anthracite, to lessen the reporting burden of respondents. Bureau employment data include production, development, maintenance, supervisory, shop, and technical personnel, plus partners or firm members who perform duties directly related to coal production. Sales and office workers and others not connected with production are excluded.

Summarized distribution data appearing in table 28 are collected by the Bureau from producers, wholesalers, and dock operators by coal year (April 1–March 31) rather than calendar year because the former conforms more closely to the actual heating season. The complete report presents detailed information on shipments by sizes and method of movement to selected markets in the United States and Canada. Copies may be obtained by writing to the Bureau of Mines, U.S. Department of the Interior, Washington, D.C., 20240, or to the Publications Distribution Section, 4800 Forbes Avenue, Pittsburgh, Pa., 15213.

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## ACKNOWLEDGMENTS

Because Bureau of Mines canvasses of the Pennsylvania anthracite industry are restricted to such subjects as production by sizes, carrier method, employment, f.o.b. preparation-plant value, injuries, mining equipment, distribution, sources of production, and retail-dealer stocks and deliveries, the authors have made free use of relevant data from numerous sources. Although care has been taken to acknowledge each individual source by footnote reference, the Bureau would like to express its thanks to the Pennsylvania Department of Mines and Mineral Industries, the Association of American Railroads, Commonwealth of Massachusetts, Upper Lake Docks Coal Bureau, Inc., the Ore and Coal Exchange, and the Anthractie Institute for their continued cooperation. However, as it would have been patently impossible to prepare this chapter without cooperation from the industry, the Bureau also extends its sincere appreciation to hundreds of producers who voluntarily submitted annual reports on their operations.

## PRODUCTION, MINING METHODS, AND EQUIPMENT

Production of Pennsylvania anthracite totaled 17.2 million short tons in 1964, a decrease of 1.1 million tons, or 6 percent, from that of 1963. Despite this decrease, production from culm and silt banks showed a minor gain (less than 1 percent), and the quantity of coal recovered from rivers and their tributaries increased 2 percent. Thus, all of the decrease was attributable to production from underground mines and strip pits. Underground production dropped to 34 percent of total production, compared with 37 percent in 1963; strip pits accounted for 42 percent (41 percent in 1963); culm banks, 20 percent (18 percent in 1963); and river coal 4 percent (the same as in 1963).

Each of the three producing regions showed losses in 1964. In the Lehigh region, total production was 13 percent below that of 1963, with decreases of 16 percent in production from underground mines, 4 percent at strip pits, and 28 percent from culm banks. In the Schuylkill region, where production was more stable (decreasing only 0.2 percent from 1963), the loss of 14 percent at underground operations was about offset by gains in production of 2, 9, and 14 percent

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for dredges, strip pits, and culm and silt banks, respectively. The Wyoming region recorded a gain of 27 percent in output from culm and silt banks, but had losses of 10 and 22 percent, respectively, in production from underground mines and stripping operations. The Schuylkill region contributed 51 percent of the total production, an increase of 3 percentage points over 1963; the Wyoming production dropped 2 points from 32 to 30 percent; and the output from the Lehigh dropped from 20 to 19 percent.

Northumberland County was the only major anthracite producing county to show an increase in production (6 percent). Output decreased 11 percent in Luzerne County, 11 percent in Schuylkill County, and 4 percent in Lackawanna County. Production data by counties, regions, and fields are shown in tables 4, 7, 8, and 9. Figure 1 shows trends in anthracite shipments, by regions, for 1940–64.

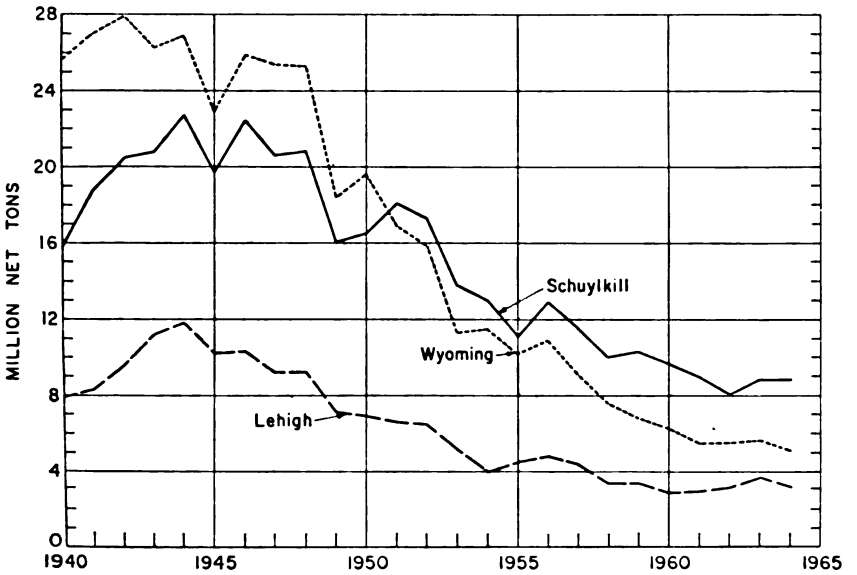


FIGURE 1.—Pennsylvania anthracite shipped from the Lehigh, Schuylkill, and Wyoming regions, 1940–64.

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## TABLE 4.—Commercial production of Pennsylvania anthracite in 1964, by regions and sizes

| Size | From preparation plants | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Lehigh region | | | Schuylkill region | | | Wyoming region [1] | | |
| | Rail | Truck | Total | Rail | Truck | Total | Rail | Truck | Total |
| Net tons: | | | | | | | | | |
| Lump [2] and broken | | | | 252 | 241 | 493 | 1,001 | 70 | 1,071 |
| Egg | 94,946 | 8,977 | 103,923 | 68,548 | 3,389 | 71,937 | 228,087 | 6,299 | 234,386 |
| Stove | 281,267 | 95,281 | 376,548 | 461,551 | 451,561 | 913,112 | 604,442 | 166,683 | 771,125 |
| Chestnut | 188,012 | 260,353 | 448,365 | 469,618 | 677,658 | 1,147,276 | 478,349 | 401,858 | 880,207 |
| Pea | 73,019 | 253,525 | 326,544 | 285,605 | 447,765 | 733,370 | 203,690 | 450,324 | 654,014 |
| Total pea and larger | 637,244 | 618,136 | 1,255,380 | 1,285,574 | 1,580,614 | 2,866,188 | 1,515,569 | 1,025,234 | 2,540,803 |
| Buckwheat No. 1 | 108,437 | 223,316 | 331,753 | 427,827 | 481,652 | 909,479 | 277,022 | 426,510 | 703,532 |
| Buckwheat No. 2 (rice) | 82,485 | 251,823 | 334,308 | 233,328 | 515,776 | 749,104 | 168,094 | 299,759 | 467,853 |
| Buckwheat No. 3 (barley) | 144,413 | 203,551 | 347,964 | 326,689 | 619,505 | 946,194 | 327,063 | 196,803 | 523,866 |
| Buckwheat No. 4 | 152,272 | 62,239 | 214,511 | 315,102 | 218,154 | 533,256 | 96,082 | 15,223 | 111,305 |
| Buckwheat No. 5 | 342,144 | 43,255 | 385,399 | 766,846 | 311,374 | 1,078,220 | 123,491 | 33,271 | 156,762 |
| Other [3] | 145,293 | 164,520 | 309,813 | 500,415 | 495,540 | 995,955 | | 574,055 | 574,055 |
| Total buckwheat No. 1 and smaller | 975,044 | 948,704 | 1,923,748 | 2,570,207 | 2,642,001 | 5,212,208 | 991,752 | 1,545,621 | 2,537,373 |
| Grand total | 1,612,288 | 1,566,840 | 3,179,128 | 3,855,781 | 4,222,615 | 8,078,396 | 2,507,321 | 2,570,855 | 5,078,176 |
| Value: | | | | | | | | | |
| Lump [2] and broken | | | | $3,467 | $3,318 | $6,785 | $12,432 | $869 | $13,301 |
| Egg | $1,239,957 | $115,654 | $1,355,611 | 885,721 | 43,765 | 929,486 | 2,942,819 | 81,560 | 3,024,379 |
| Stove | 3,767,494 | 1,281,808 | 5,049,302 | 5,930,903 | 5,569,209 | 11,500,112 | 7,896,551 | 2,173,491 | 10,070,042 |
| Chestnut | 2,505,145 | 3,522,469 | 6,027,614 | 6,033,703 | 8,325,886 | 14,359,589 | 6,284,080 | 5,320,116 | 11,604,196 |
| Pea | 784,621 | 2,827,217 | 3,611,838 | 2,977,092 | 4,489,961 | 7,467,053 | 2,275,674 | 5,195,330 | 7,471,004 |
| Total pea and larger | 8,297,217 | 7,747,148 | 16,044,365 | 15,830,886 | 18,432,139 | 34,263,025 | 19,411,556 | 12,771,366 | 32,182,922 |
| Buckwheat No. 1 | 1,028,029 | 2,184,823 | 3,212,852 | 4,142,188 | 4,427,395 | 8,569,583 | 2,705,010 | 4,358,760 | 7,063,770 |
| Buckwheat No. 2 (rice) | 805,560 | 2,537,873 | 3,343,433 | 2,081,472 | 4,649,471 | 6,730,943 | 1,617,950 | 2,932,876 | 4,550,826 |
| Buckwheat No. 3 (barley) | 1,052,074 | 1,455,800 | 2,507,874 | 2,249,104 | 4,254,564 | 6,503,668 | 2,258,594 | 1,373,138 | 3,631,732 |
| Buckwheat No. 4 | 794,529 | 349,479 | 1,144,008 | 1,607,295 | 1,048,507 | 2,655,802 | 500,681 | 80,128 | 580,809 |
| Buckwheat No. 5 | 1,779,613 | 214,483 | 1,994,096 | 3,580,432 | 1,193,774 | 4,774,206 | 607,549 | 168,214 | 775,763 |
| Other [3] | 491,921 | 487,774 | 979,695 | 1,613,712 | 1,746,446 | 3,360,158 | | 1,072,803 | 1,072,803 |
| Total buckwheat No. 1 and smaller | 5,951,726 | 7,230,232 | 13,181,958 | 15,274,203 | 17,320,157 | 32,594,360 | 7,689,784 | 9,985,919 | 17,675,703 |
| Grand total | 14,248,943 | 14,977,380 | 29,226,323 | 31,105,089 | 35,752,296 | 66,857,385 | 27,101,340 | 22,757,285 | 49,858,625 |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Average value per ton: | | | | | | | | | |
| Lump[2] and broken | | | | $13.76 | $13.77 | $13.76 | $12.42 | $12.41 | $12.42 |
| Egg | $13.06 | $12.88 | $13.04 | 12.92 | 12.91 | 12.92 | 12.90 | 12.95 | 12.90 |
| Stove | 13.39 | 13.45 | 13.41 | 12.85 | 12.33 | 12.59 | 13.06 | 13.04 | 13.06 |
| Chestnut | 13.32 | 13.53 | 13.44 | 12.85 | 12.29 | 12.52 | 13.14 | 13.24 | 13.18 |
| Pea | 10.75 | 11.15 | 11.06 | 10.42 | 10.03 | 10.18 | 11.17 | 11.54 | 11.42 |
| Total pea and larger | 13.02 | 12.53 | 12.78 | 12.31 | 11.66 | 11.95 | 12.81 | 12.46 | 12.67 |
| Buckwheat No. 1 | 9.48 | 9.78 | 9.68 | 9.68 | 9.19 | 9.42 | 9.76 | 10.22 | 10.04 |
| Buckwheat No. 2 (rice) | 9.77 | 10.08 | 10.00 | 8.92 | 9.01 | 8.99 | 9.63 | 9.78 | 9.73 |
| Buckwheat No. 3 (barley) | 7.29 | 7.15 | 7.21 | 6.88 | 6.87 | 6.87 | 6.91 | 6.98 | 6.93 |
| Buckwheat No. 4 | 5.22 | 5.62 | 5.33 | 5.10 | 4.81 | 4.98 | 5.21 | 5.26 | 5.22 |
| Buckwheat No. 5 | 5.20 | 4.96 | 5.17 | 4.67 | 3.83 | 4.43 | 4.92 | 5.06 | 4.95 |
| Other[3] | 3.39 | 2.96 | 3.16 | 3.22 | 3.52 | 3.37 | ---------- | 1.87 | 1.87 |
| Total buckwheat No. 1 and smaller | 6.10 | 7.62 | 6.85 | 5.94 | 6.56 | 6.25 | 7.75 | 6.46 | 6.97 |
| Grand total | 8.84 | 9.56 | 9.19 | 8.07 | 8.47 | 8.28 | 10.81 | 8.85 | 9.82 |

See footnotes at end of table.

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TABLE 4.—Commercial production of Pennsylvania anthracite in 1964, by regions and sizes—Continued

| Size | Total preparation plants | | | From river dredging | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Rail | Truck | Total | Rail | Truck | Total | Rail | Truck | Total |
| Net tons: | | | | | | | | | |
| Lump [2] and broken | 1,253 | 311 | 1,564 | | | | 1,253 | 311 | 1,564 |
| Egg | 391,581 | 18,665 | 410,246 | | | | 391,581 | 18,665 | 410,246 |
| Stove | 1,347,260 | 713,525 | 2,060,785 | | | | 1,347,260 | 713,525 | 2,060,785 |
| Chestnut | 1,135,979 | 1,339,869 | 2,475,848 | | | | 1,135,979 | 1,339,869 | 2,475,848 |
| Pea | 562,314 | 1,151,614 | 1,713,928 | | | | 562,314 | 1,151,614 | 1,713,928 |
| Total pea and larger | 3,438,387 | 3,223,984 | 6,662,371 | | | | 3,438,387 | 3,223,984 | 6,662,371 |
| Buckwheat No. 1 | 813,286 | 1,131,478 | 1,944,764 | | 58 | 58 | 813,286 | 1,131,536 | 1,944,822 |
| Buckwheat No. 2 (rice) | 483,907 | 1,067,358 | 1,551,265 | | 212 | 212 | 483,907 | 1,067,570 | 1,551,477 |
| Buckwheat No. 3 (barley) | 798,165 | 1,019,859 | 1,818,024 | | 104 | 104 | 798,165 | 1,019,963 | 1,818,128 |
| Buckwheat No. 4 | 563,456 | 295,616 | 859,072 | | 27,800 | 27,800 | 563,456 | 323,416 | 886,872 |
| Buckwheat No. 5 | 1,232,481 | 387,900 | 1,620,381 | 15,500 | 28,509 | 44,009 | 1,247,981 | 416,409 | 1,664,390 |
| Other [3] | 645,708 | 1,234,115 | 1,879,823 | 545,733 | 86,832 | 632,565 | 1,191,441 | 1,320,947 | 2,512,388 |
| Total buckwheat No. 1 and smaller | 4,537,003 | 5,136,326 | 9,673,329 | 561,233 | 143,515 | 704,748 | 5,098,236 | 5,279,841 | 10,378,077 |
| Grand total | 7,975,390 | 8,360,310 | 16,335,700 | 561,233 | 143,515 | 704,748 | 8,536,623 | 8,503,825 | 17,040,448 |
| Value: | | | | | | | | | |
| Lump [2] and broken | $15,899 | $4,187 | $20,086 | | | | $15,899 | $4,187 | $20,086 |
| Egg | 5,068,497 | 240,979 | 5,309,476 | | | | 5,068,497 | 240,979 | 5,309,476 |
| Stove | 17,594,948 | 9,024,508 | 26,619,456 | | | | 17,594,948 | 9,024,508 | 26,619,456 |
| Chestnut | 14,822,928 | 17,168,471 | 31,991,399 | | | | 14,822,928 | 17,168,471 | 31,991,399 |
| Pea | 6,037,387 | 12,512,508 | 18,549,895 | | | | 6,037,387 | 12,512,508 | 18,549,895 |
| Total pea and larger | 43,539,659 | 38,950,653 | 82,490,312 | | | | 43,539,659 | 38,950,653 | 82,490,312 |
| Buckwheat No. 1 | 7,875,227 | 10,970,978 | 18,846,205 | | $406 | $406 | 7,875,227 | 10,971,384 | 18,846,611 |
| Buckwheat No. 2 (rice) | 4,504,982 | 10,120,220 | 14,625,202 | | 1,696 | 1,696 | 4,504,982 | 10,121,916 | 14,626,898 |
| Buckwheat No. 3 (barley) | 5,559,772 | 7,083,502 | 12,643,274 | | 780 | 780 | 5,559,772 | 7,084,282 | 12,644,054 |
| Buckwheat No. 4 | 2,902,505 | 1,478,114 | 4,380,619 | | 104,233 | 104,233 | 2,902,505 | 1,582,347 | 4,484,852 |
| Buckwheat No. 5 | 5,967,594 | 1,576,471 | 7,544,065 | $56,000 | 100,668 | 156,668 | 6,023,594 | 1,677,139 | 7,700,733 |
| Other [3] | 2,105,633 | 3,307,023 | 5,412,656 | 1,814,642 | 279,268 | 2,093,910 | 3,920,275 | 3,586,291 | 7,506,566 |
| Total buckwheat No. 1 and smaller | 28,915,713 | 34,536,308 | 63,452,021 | 1,870,642 | 487,051 | 2,357,693 | 30,786,355 | 35,023,359 | 65,809,714 |
| Grand total | 72,455,372 | 73,486,961 | 145,942,333 | 1,870,642 | 487,051 | 2,357,693 | 74,326,014 | 73,974,012 | 148,300,026 |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Average value per ton: | | | | | | | | | |
| Lump [2] and broken | $12.69 | $13.46 | $12.84 | | | | $12.69 | $13.46 | $12.84 |
| Egg | 12.94 | 12.91 | 12.94 | | | | 12.94 | 12.91 | 12.94 |
| Stove | 13.06 | 12.65 | 12.92 | | | | 13.06 | 12.65 | 12.92 |
| Chestnut | 13.05 | 12.81 | 12.92 | | | | 13.05 | 12.81 | 12.92 |
| Pea | 10.74 | 10.87 | 10.82 | | | | 10.74 | 10.87 | 10.82 |
| Total pea and larger | 12.66 | 12.08 | 12.38 | | | | 12.66 | 12.08 | 12.38 |
| Buckwheat No. 1 | 9.68 | 9.70 | 9.69 | | $7.00 | $7.00 | 9.68 | 9.70 | 9.69 |
| Buckwheat No. 2 (rice) | 9.31 | 9.48 | 9.43 | | 8.00 | 8.00 | 9.31 | 9.48 | 9.43 |
| Buckwheat No. 3 (barley) | 6.97 | 6.95 | 6.95 | | 7.50 | 7.50 | 6.97 | 6.95 | 6.95 |
| Buckwheat No. 4 | 5.15 | 5.00 | 5.10 | | 3.75 | 3.75 | 5.15 | 4.89 | 5.06 |
| Buckwheat No. 5 | 4.84 | 4.06 | 4.66 | $3.61 | 3.53 | 3.56 | 4.83 | 4.03 | 4.63 |
| Other [3] | 3.26 | 2.68 | 2.88 | 3.33 | 3.22 | 3.31 | 3.29 | 2.71 | 2.99 |
| Total buckwheat No. 1 and smaller | 6.37 | 6.72 | 6.56 | 3.33 | 3.39 | 3.35 | 6.04 | 6.63 | 6.34 |
| Grand total | 9.08 | 8.79 | 8.93 | 3.33 | 3.39 | 3.35 | 8.71 | 8.70 | 8.70 |

[1] Includes Sullivan County.
[2] Quantity of lump included is insignificant.
[3] Includes various mixtures of buckwheat Nos. 2 to 5 and coal of relatively low dollar value.

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**TABLE 5.—Sizes of Pennsylvania anthracite prepared at plants in 1964, by regions, in percent of total**

(Excludes dredge coal)

| Size | Lehigh region | | | Schuylkill region | | |
|---|---|---|---|---|---|---|
| | Shipped by rail | Shipped by truck | Total | Shipped by rail | Shipped by truck | Total |
| Lump [1] and broken | | | | [2] | [2] | [2] |
| Egg | 5.9 | 0.6 | 3.3 | 1.8 | 0.1 | 0.9 |
| Stove | 17.4 | 6.1 | 11.6 | 11.9 | 10.7 | 11.3 |
| Chestnut | 11.7 | 16.6 | 14.1 | 12.2 | 16.0 | 14.2 |
| Pea | 4.5 | 16.2 | 10.3 | 7.4 | 10.6 | 9.1 |
| Total pea and larger | 39.5 | 39.5 | 39.5 | 33.3 | 37.4 | 35.5 |
| Buckwheat No. 1 | 6.7 | 14.2 | 10.4 | 11.1 | 11.4 | 11.3 |
| Buckwheat No. 2 (rice) | 5.1 | 16.1 | 10.5 | 6.0 | 12.2 | 9.3 |
| Buckwheat No. 3 (barley) | 9.0 | 13.0 | 11.0 | 8.5 | 14.7 | 11.7 |
| Buckwheat No. 4 | 9.5 | 4.0 | 6.8 | 8.2 | 5.2 | 6.6 |
| Buckwheat No. 5 | 21.2 | 2.7 | 12.1 | 19.9 | 7.4 | 13.3 |
| Other [3] | 9.0 | 10.5 | 9.7 | 13.0 | 11.7 | 12.3 |
| Total buckwheat No. 1 and smaller | 60.5 | 60.5 | 60.5 | 66.7 | 62.6 | 64.5 |

| Size | Wyoming region [4] | | | Total | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Lump [1] and broken | [2] | [2] | [2] | [2] | [2] | [2] |
| Egg | 9.1 | 0.3 | 4.6 | 4.9 | 0.2 | 2.5 |
| Stove | 24.1 | 6.5 | 15.2 | 16.9 | 8.6 | 12.6 |
| Chestnut | 19.1 | 15.6 | 17.3 | 14.2 | 16.0 | 15.2 |
| Pea | 8.1 | 17.5 | 12.9 | 7.1 | 13.8 | 10.5 |
| Total pea and larger | 60.4 | 39.9 | 50.0 | 43.1 | 38.6 | 40.8 |
| Buckwheat No. 1 | 11.1 | 16.6 | 13.9 | 10.2 | 13.5 | 11.9 |
| Buckwheat No. 2 (rice) | 6.7 | 11.7 | 9.2 | 6.1 | 12.8 | 9.5 |
| Buckwheat No. 3 (barley) | 13.1 | 7.6 | 10.3 | 10.0 | 12.2 | 11.1 |
| Buckwheat No. 4 | 3.8 | .6 | 2.2 | 7.1 | 3.5 | 5.3 |
| Buckwheat No. 5 | 4.9 | 1.3 | 3.1 | 15.4 | 4.6 | 9.9 |
| Other [3] | | 22.3 | 11.3 | 8.1 | 14.8 | 11.5 |
| Total buckwheat No. 1 and smaller | 39.6 | 60.1 | 50.0 | 56.9 | 61.4 | 59.2 |

[1] Quantity of lump included is insignificant.
[2] Less than 0.05 percent.
[3] Includes various mixtures of buckwheat Nos. 2 to 5 and coal of relatively low value.
[4] Includes Sullivan County.

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**TABLE 6.—Sizes of Pennsylvania anthracite prepared at plants, by regions in percent of total**

(Excludes dredge coal)

| Size | Lehigh region | | | | | Schuylkill region | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1960 | 1961 | 1962 | 1963 | 1964 | 1960 | 1961 | 1962 | 1963 | 1964 |
| Lump [1] and broken | ------ | (2) | ------ | ------ | ------ | 0.1 | (2) | (2) | (2) | (2) |
| Egg | 0.9 | 1.8 | 3.1 | 2.3 | 3.3 | .5 | 0.6 | 0.9 | 1.1 | 0.9 |
| Stove | 11.5 | 11.6 | 10.7 | 9.7 | 11.8 | 11.8 | 12.0 | 12.2 | 11.9 | 11.3 |
| Chestnut | 15.4 | 15.9 | 12.5 | 11.7 | 14.1 | 15.3 | 15.8 | 15.4 | 15.0 | 14.2 |
| Pea | 11.1 | 11.2 | 10.8 | 10.1 | 10.3 | 10.1 | 10.3 | 10.7 | 10.3 | 9.1 |
| Total pea and larger | 38.9 | 40.5 | 37.1 | 33.8 | 39.5 | 37.8 | 38.7 | 39.2 | 38.3 | 35.5 |
| Buckwheat No. 1 | 10.8 | 12.3 | 11.0 | 9.3 | 10.4 | 12.1 | 11.7 | 12.4 | 12.3 | 11.3 |
| Buckwheat No. 2 (rice) | 8.6 | 8.9 | 8.6 | 8.7 | 10.5 | 9.5 | 9.2 | 9.5 | 9.7 | 9.3 |
| Buckwheat No. 3 (barley) | 9.0 | 10.2 | 8.8 | 9.8 | 11.0 | 13.2 | 12.0 | 11.1 | 11.2 | 11.7 |
| Buckwheat No. 4 | 7.3 | 9.0 | 6.8 | 7.8 | 6.8 | 7.3 | 7.2 | 7.2 | 6.8 | 6.6 |
| Buckwheat No. 5 | 10.9 | 11.1 | 10.6 | 16.8 | 12.1 | 11.6 | 10.8 | 12.7 | 12.8 | 13.3 |
| Other [3] | 14.5 | 8.0 | 17.1 | 13.8 | 9.7 | 8.5 | 10.4 | 7.9 | 8.9 | 12.3 |
| Total buckwheat No. 1 and smaller | 61.1 | 59.5 | 62.9 | 66.2 | 60.5 | 62.2 | 61.3 | 60.8 | 61.7 | 64.5 |

| Size | Wyoming region [4] | | | | | Total | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1960 | 1961 | 1962 | 1963 | 1964 | 1960 | 1961 | 1962 | 1963 | 1964 |
| Lump [1] and broken | 0.1 | 0.1 | (2) | (2) | (2) | 0.1 | 0.1 | (2) | (2) | (2) |
| Egg | .7 | 1.9 | 4.4 | 4.9 | 4.6 | .6 | 1.2 | 2.5 | 2.6 | 2.5 |
| Stove | 14.7 | 15.3 | 15.8 | 16.7 | 15.2 | 12.8 | 13.0 | 13.2 | 13.0 | 12.6 |
| Chestnut | 19.8 | 20.2 | 17.7 | 18.5 | 17.3 | 16.9 | 17.3 | 15.6 | 15.4 | 15.2 |
| Pea | 14.0 | 14.5 | 13.8 | 13.9 | 12.9 | 11.6 | 11.8 | 11.8 | 11.4 | 10.5 |
| Total pea and larger | 49.3 | 52.0 | 51.7 | 54.0 | 50.0 | 42.0 | 43.4 | 43.1 | 42.4 | 40.8 |
| Buckwheat No. 1 | 16.0 | 15.1 | 15.1 | 15.1 | 13.9 | 13.3 | 12.9 | 13.1 | 12.6 | 11.9 |
| Buckwheat No. 2 (rice) | 9.2 | 9.4 | 9.1 | 9.3 | 9.2 | 9.2 | 9.2 | 9.2 | 9.3 | 9.5 |
| Buckwheat No. 3 (barley) | 10.9 | 11.3 | 10.5 | 10.9 | 10.3 | 11.8 | 11.5 | 10.5 | 10.8 | 11.1 |
| Buckwheat No. 4 | 2.2 | 3.0 | 2.3 | 2.4 | 2.2 | 5.5 | 6.1 | 5.4 | 5.6 | 5.3 |
| Buckwheat No. 5 | 3.3 | 4.3 | 4.8 | 4.0 | 3.1 | 8.6 | 8.7 | 9.5 | 10.8 | 9.9 |
| Other [3] | 9.1 | 4.9 | 6.5 | 4.3 | 11.3 | 9.6 | 8.2 | 9.2 | 8.5 | 11.5 |
| Total buckwheat No. 1 and smaller | 50.7 | 48.0 | 48.3 | 46.0 | 50.0 | 58.0 | 56.6 | 56.9 | 57.6 | 59.2 |

[1] Quantity of lump included is insignificant.
[2] Less than 0.05 percent.
[3] Includes various mixtures of buckwheat Nos. 2 to 5 and coal of relatively low value.
[4] Includes Sullivan County.

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**TABLE 7.—Production of Pennsylvania anthracite in 1964, by regions**

| Region | Production | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Rail shipments | | Truck shipments | | Colliery fuel | | Total | |
| | Net tons | Value [1] | Net tons | Value [1] | Net tons | Value | Net tons | Value [1] |
| Lehigh: Preparation plants | 1,612,288 | $14,248,943 | 1,566,840 | $14,977,380 | 7,703 | $69,905 | 3,186,831 | $29,296,228 |
| Schuylkill: | | | | | | | | |
| Preparation plants | 3,855,781 | 31,105,089 | 4,222,615 | 35,752,296 | 7,985 | 68,081 | 8,086,381 | 66,925,466 |
| Dredges | 561,233 | 1,870,642 | 143,515 | 487,051 | 500 | 1,500 | 705,248 | 2,359,193 |
| Total, Schuylkill | 4,417,014 | 32,975,731 | 4,366,130 | 36,239,347 | 8,485 | 69,581 | 8,791,629 | 69,284,659 |
| Wyoming: Preparation plants [2] | 2,507,321 | 27,101,340 | 2,570,855 | 22,757,285 | 127,615 | 208,063 | 5,205,791 | 50,066,688 |
| Total: | | | | | | | | |
| Preparation plants | 7,975,390 | 72,455,372 | 8,360,310 | 73,486,961 | 143,303 | 346,049 | 16,479,003 | 146,288,382 |
| Dredges | 561,233 | 1,870,642 | 143,515 | 487,051 | 500 | 1,500 | 705,248 | 2,359,193 |
| Grand total | 8,536,623 | 74,326,014 | 8,503,825 | 73,974,012 | 143,803 | 347,549 | 17,184,251 | 148,647,575 |

[1] Value given for shipments is that at which coal left possession of producing company; does not include selling expenses.
[2] Includes Sullivan County.

**TABLE 8.—Pennsylvania anthracite produced, 1960–64, by fields, in net tons**

| Field | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Eastern Middle: Breakers and washeries | 2,121,500 | 2,002,163 | 2,257,038 | 2,657,499 | 2,188,777 |
| Western Middle: | | | | | |
| Breakers and washeries | 5,104,897 | 4,673,983 | 3,723,273 | 4,270,454 | 4,492,491 |
| Dredges | 71,828 | 58,287 | 41,105 | 36,095 | 33,667 |
| Total | 5,176,725 | 4,732,270 | 3,764,378 | 4,306,549 | 4,526,158 |
| Southern: | | | | | |
| Breakers and washeries | 4,530,628 | 4,486,037 | 4,515,339 | 4,857,977 | 4,591,944 |
| Dredges | 640,335 | 687,561 | 685,946 | 655,635 | 671,581 |
| Total | 5,170,963 | 5,173,598 | 5,201,285 | 5,513,612 | 5,263,525 |
| Northern: Breakers and washeries [1] | 6,348,253 | 5,538,408 | 5,670,945 | 5,789,724 | 5,205,791 |
| Total: | | | | | |
| Breakers and washeries | 18,105,278 | 16,700,591 | 16,166,595 | 17,575,654 | 16,479,003 |
| Dredges | 712,163 | 745,848 | 727,051 | 691,730 | 705,248 |
| Grand total | 18,817,441 | 17,446,439 | 16,893,646 | 18,267,384 | 17,184,251 |

[1] Includes Sullivan County.

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**TABLE 9.—Production of Pennsylvania anthracite in 1964, by counties**

| County | Production | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Rail shipments | | Truck shipments | | Colliery fuel | | Total | |
| | Net tons | Value [1] | Net tons | Value [1] | Net tons | Value | Net tons | Value [1] |
| Berks, Lancaster, and Synder | 545,333 | $1,812,642 | 106,752 | $346,868 | -------- | -------- | 652,085 | $2,159,510 |
| Carbon | 428,677 | 4,158,687 | 72,770 | 269,527 | -------- | -------- | 501,447 | 4,428,214 |
| Columbia | 703,668 | 6,714,750 | 119,256 | 865,975 | 183 | $1,279 | 823,107 | 7,582,004 |
| Dauphin | 206,520 | 872,443 | 48,803 | 234,672 | -------- | -------- | 255,323 | 1,107,115 |
| Lackawanna | 511,465 | 5,371,903 | 407,661 | 3,908,400 | 1,073 | 9,307 | 920,199 | 9,289,610 |
| Lebanon | 21,446 | 160,973 | 9,404 | 50,930 | -------- | -------- | 30,850 | 211,903 |
| Luzerne | 2,933,618 | 29,657,697 | 2,968,108 | 26,867,364 | 133,940 | 266,441 | 6,035,666 | 56,791,502 |
| Northumberland | 878,238 | 6,143,304 | 1,267,337 | 10,367,150 | 815 | 4,210 | 2,146,390 | 16,514,664 |
| Schuylkill | 2,307,305 | 19,430,366 | 3,486,380 | 30,967,708 | 7,792 | 66,312 | 5,801,477 | 50,464,386 |
| Sullivan | -------- | -------- | 15,932 | 82,377 | -------- | -------- | 15,932 | 82,377 |
| Wayne | 353 | 3,249 | 1,422 | 13,041 | -------- | -------- | 1,775 | 16,290 |
| Total | 8,536,623 | 74,326,014 | 8,503,825 | 73,974,012 | 143,803 | 347,549 | 17,184,251 | 148,647,575 |

[1] Value given for shipments is that at which coal left possession of producing company; does not include selling expenses.

**Underground Mines.**—Production from underground mines decreased sharply in 1964, after having remained relatively stable for several years. The decrease (826,000 tons) was largely attributable to declines in the shipment of fresh-mined large sizes to European markets, exclusive of anthracite shipped to the U.S. Armed Forces in West Germany. There was little change in the proportion of tonnage contributed by each region. Of total underground production, the Lehigh region remained the same as 1963, 1 percent; the Schuylkill region dropped to 53 percent (54 percent in 1963); and the Wyoming rose to 46 percent (45 percent in 1963). In the Lehigh region production from underground mines decreased 16,000 tons, or 16 percent; in the Schuylkill region, 500,000 tons or 14 percent; and in the Wyoming region, 310,000 tons, or 10 percent. Detailed data on production by source, fields, and regions are shown in tables 10 and 11. Figures 2 and 3 show trends in production by source.

**TABLE 10.—Pennsylvania anthracite produced in 1964, classified as fresh-mined, culm-bank, and river coal, by fields, in net tons**

| Field | Fresh-mined coal | | | | From culm banks | From river dredging | Total |
|---|---|---|---|---|---|---|---|
| | Underground mines | | | Strip pits | | | |
| | Mechanically loaded | Hand loaded | Total | | | | |
| Eastern Middle | 38,100 | 14,144 | 52,244 | 1,407,288 | 729,245 | ---------- | 2,188,777 |
| Western Middle | 366,547 | 810,520 | 1,177,067 | 2,235,016 | 1,080,408 | 33,667 | 4,526,158 |
| Southern | 424,700 | 1,559,426 | 1,984,126 | 1,901,455 | 706,363 | 671,581 | 5,263,525 |
| Northern [1] | 2,625,687 | 49,702 | 2,675,389 | 1,633,429 | 896,973 | ---------- | 5,205,791 |
| Total | 3,455,034 | 2,433,792 | 5,888,826 | 7,177,188 | 3,412,989 | 705,248 | 17,184,251 |

[1] Includes Sullivan County.

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**TABLE 11.—Pennsylvania anthracite produced in 1964, classified as fresh-mined, culm-bank, and river coal, by regions, in net tons**

| Region | Fresh-mined coal | | | | From culm banks | From river dredging | Total |
|---|---|---|---|---|---|---|---|
| | Underground mines | | | Strip pits | | | |
| | Mechanically loaded | Hand loaded | Total | | | | |
| Lehigh | 38,100 | 42,843 | 80,943 | 2,170,162 | 935,726 | ---------- | 3,186,831 |
| Schuylkill | 791,247 | 2,341,247 | 3,132,494 | 3,373,597 | 1,580,290 | 705,248 | 8,791,629 |
| Wyoming [1] | 2,625,687 | 49,702 | 2,675,389 | 1,633,429 | 896,973 | ---------- | 5,205,791 |
| Total | 3,455,034 | 2,433,792 | 5,888,826 | 7,177,188 | 3,412,989 | 705,248 | 17,184,251 |

[1] Includes Sullivan County.

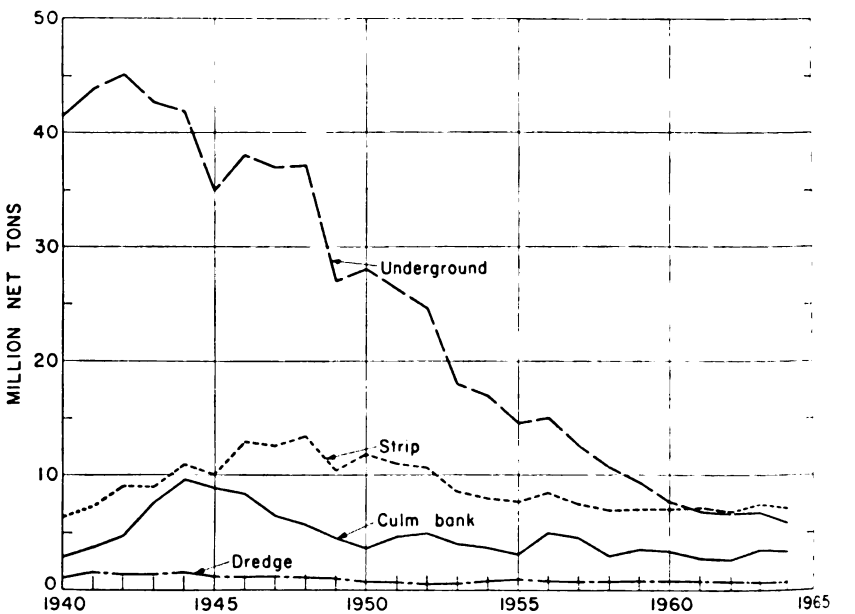


FIGURE 2.—Production of Pennsylvania anthracite, by sources, 1940–64.

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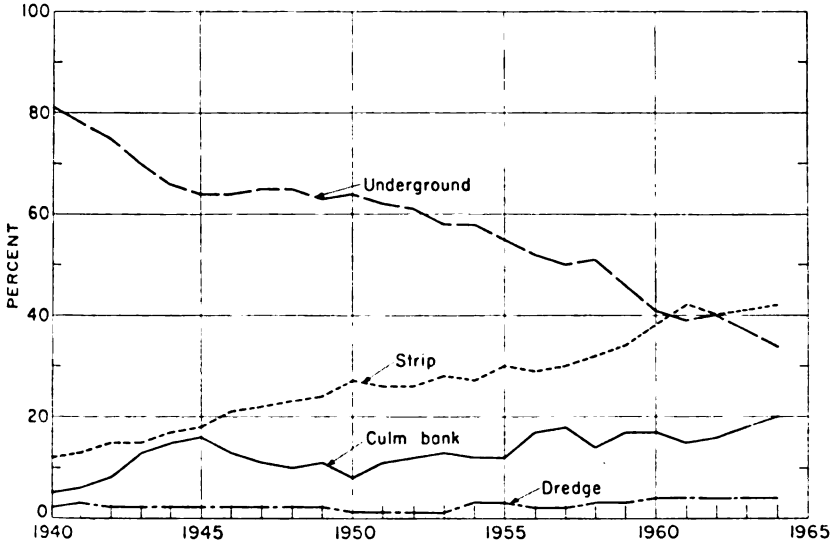


FIGURE 3.—Production of Pennsylvania anthracite, by sources, 1940–64, in percent of total.

**Strip Pits.**—Production at stripping operations declined 4 percent in 1964. In the Schuylkill region, output from strip pits increased 9 percent. In the Lehigh and Wyoming regions, however, strip-pit production decreased 4 and 22 percent, respectively. Of the total produced by stripping, 47 percent was produced in the Schuylkill region (42 percent in 1963); 30 percent in the Lehigh (the same as the previous year); and 23 percent in the Wyoming region (28 percent in 1963). Of the total fresh-mined coal (strip plus underground) produced in the Lehigh region in 1964, 96 percent originated at strip pits, in Schuylkill, 52 percent of the total was strip coal; 38 percent of the Wyoming coal was from strip pits. Comparable figures in 1963 were 96, 46, and 41 percent, respectively. Table 12 shows detailed data on strip-pit production for selected years in the period 1915–64. Figure 4 shows regional production of strip coal for 1940–64.

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TABLE 12.—Production of Pennsylvania anthracite from strip pits

| | Mined by stripping (net tons) | Percent of fresh-mined total | Number of men employed | Average number of days worked |
|---|---|---|---|---|
| 1915 | 1,121,603 | NA | NA | NA |
| 1920 | 2,054,441 | 2.5 | NA | NA |
| 1925 | 1,578,478 | 2.7 | NA | NA |
| 1930 | 2,536,288 | 3.8 | NA | NA |
| 1957 | 7,543,157 | 37.4 | 4,546 | 207 |
| 1958 | 6,877,761 | 39.1 | 4,418 | 196 |
| 1959 | 7,096,343 | 43.0 | 3,775 | 200 |
| 1960 | 7,112,288 | 48.0 | 3,470 | 195 |
| 1961 | 7,246,646 | 51.6 | 3,194 | 207 |
| 1962 | 6,822,207 | 50.6 | 3,008 | 206 |
| 1963 | 7,467,842 | 52.7 | 3,025 | 224 |
| 1964: | | | | |
| Lehigh region | 2,170,162 | 96.4 | 974 | 209 |
| Schuylkill region | 3,373,597 | 51.9 | 1,393 | 205 |
| Wyoming region [1] | 1,633,429 | 37.9 | 708 | 250 |
| Total | 7,177,188 | 54.9 | 3,075 | 217 |

NA Not available.
[1] Includes Sullivan County.

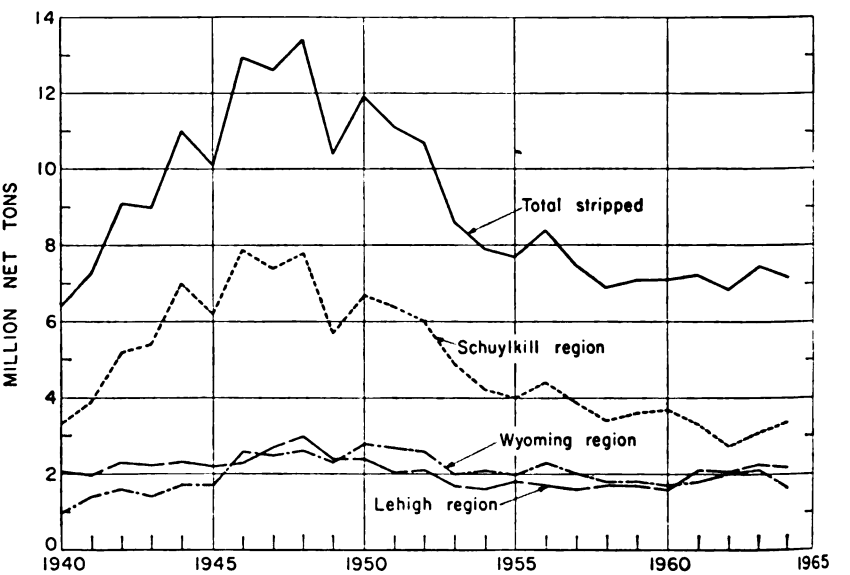


FIGURE 4.—Pennsylvania anthracite mined from strip pits, by regions, 1940–64.

**Culm Banks.**—Because of a stable market for the small sizes, anthracite reclaimed from culm and silt banks remained virtually the same. However, as some banks were depleted during the year and operations were shifted to other sites, the percentages contributed by the individual regions showed marked changes. In 1963, the Lehigh region contributed 38 percent of total culm-bank production compared with 28 percent in 1964, a decline of 28 percent. On the other hand, the Schuylkill region increased production by 14 percent and the Wyoming by 27 percent. The Wyoming region's share

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rose from 21 to 26 percent of the total reclaimed from banks and the Schuylkill region accounted for 46 percent (41 percent in 1963). The production of Pennsylvania anthracite from culm banks is shown in tables 10, 11, and 13.

**TABLE 13.—Production of Pennsylvania anthracite from culm banks, by regions, in net tons**

| | Lehigh | Schuylkill | Wyoming | Sullivan County | Total |
|---|---|---|---|---|---|
| 1935 | 192,790 | 1,748,960 | 760,718 | ---------- | 2,702,468 |
| 1936 | 136,058 | 2,532,116 | 525,798 | ---------- | 3,193,972 |
| 1937 | 101,239 | 2,178,482 | 442,878 | ---------- | 2,722,599 |
| 1938 | 53,037 | 1,941,896 | 345,511 | ---------- | 2,340,444 |
| 1939 | 64,180 | 2,159,548 | 360,086 | ---------- | 2,583,814 |
| 1940 | 192,878 | 2,109,557 | 480,603 | ---------- | 2,783,038 |
| 1941 | 326,755 | 2,881,049 | 449,062 | ---------- | 3,656,866 |
| 1942 | 745,924 | 3,529,757 | 459,373 | ---------- | 4,735,054 |
| 1943 | 1,944,047 | 4,577,917 | 1,041,841 | 19,893 | 7,583,698 |
| 1944 | 2,125,317 | 5,787,036 | 1,673,904 | 13,833 | 9,600,180 |
| 1945 | 2,086,864 | 4,936,907 | 1,728,440 | 34,448 | 8,786,659 |
| 1946 | 1,875,590 | 4,752,141 | 1,780,874 | 22,487 | 8,431,092 |
| 1947 | 1,044,501 | 3,947,016 | 1,409,217 | 2,912 | 6,403,646 |
| 1948 | 796,114 | 3,729,542 | 1,098,123 | ---------- | 5,623,779 |
| 1949 | 694,763 | 2,778,131 | 956,250 | ---------- | 4,429,144 |
| 1950 | 366,069 | 2,533,535 | 565,829 | 1,877 | 3,467,310 |
| 1951 | 566,613 | 3,578,795 | 484,792 | ---------- | 4,630,200 |
| 1952 | 791,445 | 3,407,974 | 566,097 | ---------- | 4,765,516 |
| 1953 | 714,646 | 2,792,323 | 504,031 | ---------- | 4,011,000 |
| 1954 | 797,761 | 2,320,006 | 447,715 | ---------- | 3,565,482 |
| 1955 | 862,539 | 1,934,492 | 416,015 | ---------- | 3,213,046 |
| 1956 | 1,493,381 | 2,750,838 | 530,580 | ---------- | 4,774,799 |
| 1957 | 1,457,869 | 2,479,241 | 584,300 | ---------- | 4,521,410 |
| 1958 | 605,741 | 1,742,356 | 550,756 | 3,900 | 2,902,753 |
| 1959 | 831,254 | 1,905,465 | [1] 684,135 | (1) | 3,420,854 |
| 1960 | 825,825 | 1,563,746 | 907,441 | ---------- | 3,297,012 |
| 1961 | 656,528 | 1,377,204 | 635,627 | ---------- | 2,669,359 |
| 1962 | 974,650 | 949,710 | 747,106 | ---------- | 2,671,466 |
| 1963 | 1,297,590 | 1,389,314 | 706,162 | ---------- | 3,393,066 |
| 1964 | 935,726 | 1,580,290 | 896,973 | ---------- | 3,412,989 |

[1] Sullivan County included in Wyoming region.

**Dredge Coal.**—In 1964, the production of dredge coal totaled 705,000 net tons, an increase of 2 percent over 1963. As the preponderant part of the river coal produced is "captive" tonnage (coal used by the producer) it is not nearly so responsive to fluctuations in the general market as are the small sizes produced from other sources. Tables 14 and 15 contain data on recovery of anthracite from rivers and their tributaries.

**TABLE 14.—Pennsylvania anthracite produced by dredges in 1964, by rivers**

(Including tributaries)

| River | Production (net tons) | Value | |
|---|---|---|---|
| | | Total | Average |
| Schuylkill | 97,957 | $324,143 | $3.31 |
| Susquehanna | 607,291 | 2,035,050 | 3.35 |
| Total | 705,248 | 2,359,193 | 3.35 |

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**TABLE 15.—Pennsylvania anthracite produced by dredges, by rivers**

(Including tributaries)

| | Lehigh River (net tons) | Schuylkill River (net tons) | Susquehanna River (net tons) | Total (net tons) | Total value | Average value per ton |
|---|---|---|---|---|---|---|
| 1940 | [1] 78, 947 | (1) | 863, 997 | 942, 944 | $1, 097, 000 | $1.16 |
| 1941 | 47, 838 | 396, 522 | 1, 073, 203 | 1, 517, 563 | 1, 839, 784 | 1.21 |
| 1942 | 9, 385 | 268, 919 | 1, 006, 729 | 1, 285, 033 | 1, 478, 719 | 1.15 |
| 1943 | 37, 452 | 342, 815 | 954, 470 | 1, 334, 737 | 1, 972, 777 | 1.48 |
| 1944 | 40. 894 | 494, 371 | 837, 472 | 1, 372, 737 | 2, 084, 431 | 1.52 |
| 1945 | 41, 409 | 366, 161 | 797, 656 | 1, 205, 226 | 1, 924, 148 | 1.60 |
| 1946 | 37, 441 | 247, 757 | 847, 196 | 1, 132, 394 | 2, 091, 324 | 1.85 |
| 1947 | 46, 478 | 158, 102 | 1, 015, 126 | 1, 219, 706 | 2, 480, 068 | 2.03 |
| 1948 | 54, 284 | 67, 871 | 865, 849 | 968, 004 | 2, 291, 752 | 2.32 |
| 1949 | 22, 131 | 52, 012 | 790, 979 | 865, 122 | 2, 131, 096 | 2.46 |
| 1950 | 21. 877 | 34, 222 | 563, 465 | 619, 564 | 1, 677, 508 | 2.71 |
| 1951 | 25, 344 | 27, 454 | 508, 770 | 561, 568 | 1, 576, 576 | 2.81 |
| 1952 | 17, 402 | 30, 407 | 324, 245 | 372, 054 | 1, 109, 778 | 2.98 |
| 1953 | 31, 391 | 20, 643 | 386, 147 | 438, 181 | 1, 449, 149 | 3.31 |
| 1954 | 16, 015 | ---------- | 709, 892 | 725, 907 | 1, 810, 026 | 2.49 |
| 1955 | 29, 935 | 60, 256 | 698, 652 | 788, 843 | 1, 844, 835 | 2.34 |
| 1956 | 44, 262 | 5, 540 | 666, 485 | 716, 287 | 1, 273, 415 | 1.78 |
| 1957 | 30, 650 | 10, 167 | 616, 884 | 657, 701 | 1, 143, 152 | 1.74 |
| 1958 | 30, 763 | 10, 230 | 650, 800 | 691, 793 | 1, 324, 943 | 1.92 |
| 1959 | 13, 312 | 13, 213 | 690, 094 | 716, 619 | 2, 310, 895 | 3.22 |
| 1960 | 22, 700 | 23, 624 | 665, 839 | 712, 163 | 2, 257, 367 | 3.17 |
| 1961 | 2, 975 | 122, 880 | 619, 993 | 745, 848 | 2, 355, 314 | 3.16 |
| 1962 | ---------- | 98, 076 | 628, 975 | 727, 051 | 2, 475, 987 | 3.41 |
| 1963 | ---------- | 83, 768 | 607, 962 | 691, 730 | 2, 469, 101 | 3.57 |
| 1964 | ---------- | 97, 957 | 607, 291 | 705, 248 | 2, 359, 193 | 3.35 |

[1] Schuylkill included with Lehigh in 1940.

**Weekly and Monthly Data.**—The Bureau publishes a series of weekly reports containing estimates of weekly and monthly production of Pennsylvania anthracite, as well as a record of daily and weekly carloadings. Estimates of production are derived primarily from factors based on carloading data furnished by the Association of American Railroads. Secondary factors are those for colliery fuel, river coal, and truck shipments. The weekly and monthly estimates have been adjusted to the production total for 1964 and are presented in tables

**TABLE 16.—Estimated production of Pennsylvania anthracite, in 1964 [1]**

| Week ended— | Thousand net tons | Week ended— | Thousand net tons | Week ended— | Thousand net tons |
|---|---|---|---|---|---|
| Jan. 4 | [2] 153 | May 16 | 390 | Sept. 26 | 317 |
| 11 | 429 | 23 | 391 | Oct. 3 | 326 |
| 18 | 218 | 30 | 376 | 10 | 322 |
| 25 | 437 | June 6 | 458 | 17 | 306 |
| Feb. 1 | 447 | 13 | 460 | 24 | 298 |
| 8 | 463 | 20 | 400 | 31 | 277 |
| 15 | 382 | 27 | 421 | Nov. 7 | 333 |
| 22 | 310 | July 4 | 164 | 14 | 316 |
| 29 | 349 | 11 | 115 | 21 | 334 |
| Mar. 7 | 288 | 18 | 319 | 28 | 298 |
| 14 | 259 | 25 | 350 | Dec. 5 | 337 |
| 21 | 267 | Aug. 1 | 327 | 12 | 356 |
| 28 | 293 | 8 | 311 | 19 | 333 |
| Apr. 4 | 251 | 15 | 339 | 26 | 239 |
| 11 | 277 | 22 | 287 | 31 | [2] 218 |
| 18 | 263 | 29 | 297 | | |
| 25 | 305 | Sept. 5 | 285 | Total | 17, 184 |
| May 2 | 350 | 12 | 239 | | |
| 9 | 401 | 19 | 323 | | |

[1] Estimated from weekly carloadings as reported by the Association of American Railroads and other factors; adjusted to annual production from Bureau of Mines canvass.

[2] Figures represent output of working days in that part of week included in calendar year 1964. Revised total for week of January 4, 1964 was 201,000 net tons. Preliminary production for week of January 2, 1965 was 218,000 tons.

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TABLE 17.—Estimated monthly production of Pennsylvania anthracite, in thousand net tons [1]

| Month | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|---|
| January | 2,743 | 2,625 | 2,161 | 2,318 | 1,701 | 1,767 | 1,810 | 1,799 | 1,668 |
| February | 2,360 | 2,072 | 1,753 | 1,645 | 1,643 | 1,721 | 1,522 | 1,529 | 1,520 |
| March | 2,052 | 1,798 | 1,476 | 1,593 | 1,749 | 1,438 | 1,513 | 1,489 | 1,211 |
| April | 2,258 | 2,037 | 1,545 | 1,588 | 1,281 | 1,173 | 1,257 | 1,195 | 1,454 |
| May | 1,947 | 2,294 | 1,612 | 1,466 | 1,313 | 1,418 | 1,319 | 1,524 | 1,636 |
| June | 2,470 | 2,551 | 1,963 | 1,777 | 1,496 | 1,344 | 1,339 | 1,455 | 1,816 |
| July | 1,890 | 1,478 | 1,377 | 1,206 | 1,186 | 1,178 | 906 | 1,124 | 1,182 |
| August | 2,729 | 2,294 | 1,750 | 1,600 | 1,704 | 1,533 | 1,328 | 1,606 | 1,306 |
| September | 2,509 | 2,173 | 2,050 | 1,823 | 1,580 | 1,394 | 1,193 | 1,574 | 1,300 |
| October | 2,971 | 2,262 | 1,966 | 1,805 | 1,678 | 1,603 | 1,528 | 1,822 | 1,337 |
| November | 2,629 | 1,928 | 1,559 | 1,863 | 1,692 | 1,501 | 1,664 | 1,615 | 1,340 |
| December | 2,342 | 1,826 | 1,959 | 1,965 | 1,794 | 1,376 | 1,515 | 1,535 | 1,414 |
| Total | 28,900 | 25,338 | 21,171 | 20,649 | 18,817 | 17,446 | 16,894 | 18,267 | 17,184 |

[1] Production is estimated from weekly carloadings, as reported by the Association of American Railroads, and includes mine fuel, coal sold locally, and dredge coal.

16 and 17. The weekly anthracite report also contains supplementary monthly tables on rail and truck shipments, consumption, retail-dealer stocks and deliveries, imports, exports, and other related subjects. Requests to be placed on the mailing list for this publication should be addressed to the Bureau of Mines.

**Mechanical Loading.**—With the drop in total production and 12 percent in underground mining, mechanical loading decreased 6 percent and hand loading decreased 20 percent. As a result, anthracite loaded mechanically was 59 percent of the total underground production in 1964, compared with 55 percent in 1963. The Northern field was primarily responsible for the drop as the increase in the Western Middle field more than offset small decreases in the other two fields. Figure 5 shows trends in mechanical loading, hand loading, and

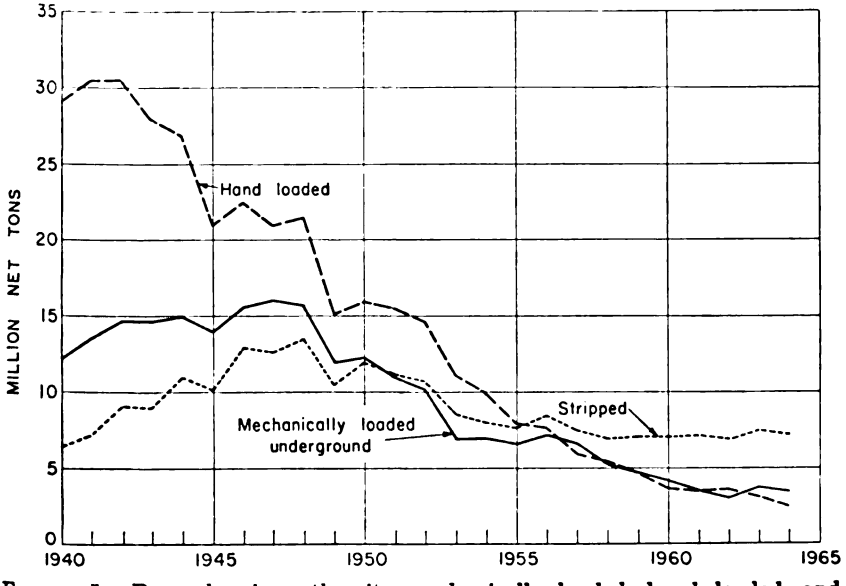


FIGURE 5.—Pennsylvania anthracite mechanically loaded, hand loaded, and stripped, 1940–64.



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stripping for 1940–64. Tables 18 and 19 present data on the tonnages loaded mechanically and the number and types of equipment used.

**TABLE 18.—Pennsylvania anthracite loaded mechanically underground, by fields, in net tons**

| Field | Scraper loaders [1] | | Pit-car loaders | | Hand-loaded face conveyors, all types [2] | | Total mechanically loaded | |
|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Northern | 1,013,878 | 1,060,916 | 110,342 | 68,601 | 1,732,058 | 1,496,170 | 2,856,278 | 2,625,687 |
| Eastern Middle | | 3,546 | 1,047 | 369 | 48,863 | 34,185 | 49,910 | 38,100 |
| Western Middle | 51,716 | 22,715 | 1,500 | 1,800 | 267,329 | 342,032 | 320,545 | 366,547 |
| Southern | 101,574 | 155,672 | 16,000 | 7,500 | 321,655 | 261,528 | 439,229 | 424,700 |
| Total | 1,167,168 | 1,242,849 | 128,889 | 78,270 | 2,369,905 | 2,133,915 | 3,665,962 | 3,455,034 |

[1] Includes mobile loaders.
[2] Shaker chutes, including those equipped with duckbills.

**TABLE 19.—Pennsylvania anthracite loaded mechanically underground, in net tons**

| Year | Scraper loaders | | Mobile loaders | | Conveyors [1] and pit-car loaders | | Total loaded mechanically | |
|---|---|---|---|---|---|---|---|---|
| | Number of units | Net tons loaded | Number of units | Net tons loaded | Number of units | Net tons loaded | Number of units | Net tons loaded |
| 1960 | 114 | 525,482 | 45 | 691,942 | 754 | 2,826,968 | 913 | 4,044,392 |
| 1961 | 132 | 595,572 | 27 | 387,417 | 616 | 2,394,789 | 775 | 3,377,778 |
| 1962 | 128 | 541,241 | 34 | 296,259 | 536 | 2,227,864 | 698 | 3,065,364 |
| 1963 | 147 | 862,252 | 30 | 304,916 | 512 | 2,498,794 | 689 | 3,665,962 |
| 1964 | 139 | 750,293 | 31 | 492,556 | 495 | 2,212,185 | 665 | 3,455,034 |

[1] Includes duckbills and other self-loading conveyors.

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**TABLE 20.—Trends in mechanical loading, hand loading, and stripping of Pennsylvania anthracite**

(Mechanical loading includes coal handled on pit-car loaders and hand-loaded face conveyors)

| Year | Fresh-mined coal | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | Underground | | | | | Strip pits | | |
| | Mechanical loading (net tons) | Percent of total, underground | Hand loading (net tons) | Percent of total, underground | Total (net tons) | Net tons | Percent of total, fresh mined | |
| 1927 | [1] 2,223,281 | 3.0 | 71,434,537 | 97.0 | 73,657,818 | 2,153,156 | [2] 2.8 | 75,810,974 |
| 1928 | [1] 2,351,074 | 3.4 | 67,373,788 | 96.6 | 69,724,862 | 2,422,924 | 3.4 | 72,147,786 |
| 1929 | 3,470,158 | 5.0 | 66,493,690 | 95.0 | 69,963,848 | 1,911,766 | 2.7 | 71,875,614 |
| 1930 | 4,467,750 | 6.9 | 60,458,344 | 93.1 | 64,926,094 | 2,536,288 | 3.8 | 67,462,382 |
| 1931 | 4,384,780 | 8.2 | 49,074,722 | 91.8 | 53,459,502 | 3,813,237 | 6.7 | 57,272,739 |
| 1932 | 5,433,340 | 12.4 | 38,400,820 | 87.6 | 43,834,160 | 3,980,973 | 8.3 | 47,815,133 |
| 1933 | 6,557,267 | 16.0 | 34,474,844 | 84.0 | 41,032,111 | 4,932,069 | 10.7 | 45,964,180 |
| 1934 | 9,284,486 | 19.1 | 39,290,255 | 80.9 | 48,574,741 | 5,798,138 | 10.7 | 54,372,879 |
| 1935 | 9,279,057 | 21.2 | 34,508,819 | 78.8 | 43,782,876 | 5,187,072 | 10.6 | 48,969,948 |
| 1936 | 10,827,946 | 24.2 | 33,898,560 | 75.8 | 44,726,506 | 6,203,267 | 12.2 | 50,929,773 |
| 1937 | 10,683,837 | 25.1 | 31,882,514 | 74.9 | 42,566,351 | 5,696,018 | 11.8 | 48,262,369 |
| 1938 | 10,151,669 | 26.6 | 27,990,628 | 73.4 | 38,142,297 | 5,095,341 | 11.8 | 43,237,638 |
| 1939 | 11,773,833 | 27.7 | 30,797,715 | 72.3 | 42,571,548 | 5,486,479 | 11.4 | 48,058,027 |
| 1940 | 12,326,000 | 29.7 | 29,190,837 | 70.3 | 41,516,837 | 6,352,700 | 13.3 | 47,869,537 |
| 1941 | 13,441,987 | 30.6 | 30,435,277 | 69.4 | 43,877,264 | 7,316,574 | 14.3 | 51,193,838 |
| 1942 | 14,741,459 | 32.6 | 30,495,240 | 67.4 | 45,236,699 | 9,070,933 | 16.7 | 54,307,632 |
| 1943 | 14,745,793 | 34.5 | 27,990,005 | 65.5 | 42,735,798 | 8,989,387 | 17.4 | 51,725,185 |
| 1944 | 14,975,146 | 35.8 | 26,800,270 | 64.2 | 41,775,416 | 10,953,030 | 20.8 | 52,728,446 |
| 1945 | 13,927,955 | 39.9 | 20,957,744 | 60.1 | 34,885,699 | 10,056,325 | 22.4 | 44,942,024 |
| 1946 | 15,619,162 | 41.0 | 22,465,295 | 59.0 | 38,084,457 | 12,858,930 | 25.2 | 50,943,387 |
| 1947 | 16,054,011 | 43.4 | 20,909,101 | 56.6 | 36,963,112 | 12,603,545 | 25.4 | 49,566,657 |
| 1948 | 15,742,368 | 42.3 | 21,432,923 | 57.7 | 37,175,291 | 13,352,874 | 26.4 | 50,528,165 |
| 1949 | 11,858,088 | 43.9 | 15,172,562 | 56.1 | 27,030,650 | 10,376,808 | 27.7 | 37,407,458 |
| 1950 | 12,335,650 | 43.8 | 15,820,245 | 56.2 | 28,155,895 | 11,833,934 | 29.6 | 39,989,829 |
| 1951 | 10,847,787 | 41.2 | 15,494,452 | 58.8 | 26,342,239 | 11,135,900 | 29.7 | 37,478,229 |
| 1952 | 10,034,464 | 40.5 | 14,713,819 | 59.5 | 24,748,283 | 10,696,705 | 30.2 | 35,444,988 |
| 1953 | 6,538,769 | 38.2 | 11,054,720 | 61.8 | 17,893,489 | 8,606,482 | 32.5 | 26,499,971 |
| 1954 | 6,978,035 | 41.4 | 9,874,373 | 58.6 | 16,852,408 | 7,999,680 | 32.0 | 24,792,088 |
| 1955 | 6,660,939 | 45.9 | 7,837,819 | 54.1 | 14,498,758 | 7,703,907 | 34.7 | 22,202,665 |
| 1956 | 7,308,110 | 48.5 | 7,746,794 | 51.5 | 15,054,904 | 8,354,230 | 35.7 | 23,409,134 |
| 1957 | 6,657,479 | 52.8 | 5,958,574 | 47.2 | 12,616,053 | 7,543,157 | 37.4 | 20,159,210 |
| 1958 | 5,332,043 | 49.8 | 5,366,792 | 50.2 | 10,698,835 | 6,877,761 | 39.1 | 17,576,596 |
| 1959 | 4,700,542 | 49.9 | 4,714,928 | 50.1 | 9,415,470 | 7,096,343 | 43.0 | 16,511,813 |
| 1960 | 4,044,392 | 52.6 | 3,651,586 | 47.4 | 7,695,978 | 7,112,288 | 48.0 | 14,808,266 |
| 1961 | 3,377,778 | 49.8 | 3,406,808 | 50.2 | 6,784,586 | 7,246,646 | 51.6 | 14,031,232 |
| 1962 | 3,065,364 | 45.9 | 3,607,558 | 54.1 | 6,672,922 | 6,822,207 | 50.6 | 13,495,129 |
| 1963 | 3,665,962 | 54.6 | 3,048,784 | 45.4 | 6,714,746 | 7,467,842 | 52.7 | 14,182,588 |
| 1964 | 3,455,084 | 58.7 | 2,433,792 | 41.3 | 5,888,826 | 7,177,188 | 54.9 | 13,066,014 |

[1] As reported by Commonwealth of Pennsylvania, Department of Mines.

**Cutting Machines.**—Six cutting machines were used in 1964, one less than in 1963. However, the total undercut before shooting rose from 240,000 tons in 1963 to 417,000 tons in 1964, all of which was produced in the Wyoming region.

**Power Equipment.**—Although strip mining decreased 4 percent from 1963, and the recovery of coal from culm banks remained virtually the same, the number of power units reported increased by 27. In 1964, 121 shovels and 231 draglines were reported used in strip mining—3 more shovels and 26 more draglines than in 1963. In bank operations, 28 shovels and 26 draglines were reported used—an increase of 2 shovels and 1 dragline. Six shovels and 7 draglines were employed during the year for both stripping and culm bank recovery. Data on power shovels and draglines utilized by the anthracite industry in 1962–64 are shown in table 21.

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**TABLE 21.—Power shovels and draglines used in recovering coal from culm banks and in stripping Pennsylvania anthracite, by types of power**

| Type of power | 1962 | | | 1963 | | | 1964 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Number of power shovels | Number of draglines | Total | Number of power shovels | Number of draglines | Total | Number of power shovels | Number of draglines | Total |
| Gasoline | 8 | 6 | 14 | 24 | 11 | 35 | 28 | 8 | 36 |
| Electric | 39 | 59 | 98 | 27 | 50 | 77 | 27 | 68 | 95 |
| Diesel | 91 | 177 | 268 | 94 | 182 | 276 | 97 | 184 | 281 |
| Diesel-electric | 5 | 6 | 11 | 1 | 3 | 4 | 3 | 4 | 7 |
| Total | 143 | 248 | 391 | 146 | 246 | 392 | 155 | 264 | 419 |

## PRICES AND VALUE OF SALES

Based on total production, including colliery fuel and dredge coal, the average value of Pennsylvania anthracite in 1964 was $8.65 per short ton, a gain of 3 percent over that for 1963. Total value of the year's output dropped to $148,648,000, or a decline of 3 percent. Prices of the larger sizes were steadier during the year than those of the smaller coals: shipments of the pea and larger size group declined 10 percent but dropped only 4 percent in total value, while shipments of the buckwheat No. 1 and smaller size category declined 3 percent and dropped 2 percent in total value.

Among the individual sizes, the industry reported average increases of $0.74 for lump and broken (average value in 1963, $12.10 per ton), $0.91 for egg ($12.03 in 1963), $0.73 for stove ($12.19 in 1963), $0.68 for chestnut ($12.24 in 1963), $0.67 for pea ($10.15 in 1963). As a result, the average per-ton value for the pea and larger group of sizes increased from $11.65 to $12.38. Average value of the buckwheat No. 1 and smaller size group was $6.34, an increase of $0.09 over the 1963 level. The largest increase ($0.63) was for buckwheat No. 1, followed by buckwheat No. 2 (rice) ($0.43), buckwheat No. 3 (barley) ($0.31), buckwheat No. 4 ($0.20), and buckwheat No. 5 ($0.22). The "Other" was the only size classification showing a decrease ($0.06). All of the foregoing individual size values exclude dredge coal.

As is customary in the Pennsylvania anthracite industry, spring discount prices were announced in late March and early April 1964. On egg, stove, and chestnut the spring prices represented a cut of $1.25–$1.50 per net ton; on pea, $0.75–$1.00; buckwheat No. 1 and No. 2 (rice), $1.00 and $0.25 on buckwheat No. 3 (barley).

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During July new prices were announced and by the end of the month, the prices quoted in Saward's Journal were higher, ranging from $0.50–$1.00 on egg and stove; $0.50–$0.85 on chestnut; $0.50–$0.60 on pea; $0.40 on buckwheat No. 1; $0.25–$0.50 on buckwheat No. 2 (rice) and $0.25 on buckwheat No. 3 (barley). After the announcement of a new wage agreement in early September, prices again rose; but, in most instances, the prices were the same or lower than those quoted in December 1963. By the end of December 1964, wholesale prices quoted in Saward's Journal were as follows: Egg and stove at $15.00 to $15.50; chestnut, $14.50–$15.25; pea, $11.85–$12.50; buckwheat No. 1, $10.40–$10.50; buckwheat No. 2 (rice), $10.50 and buckwheat No. 3 (barley) $8.50–$8.75. These prices reflected little change from those quoted in December 1963.

Average values, f.o.b. preparation plants are presented by regions in tables 23, 24, and 25. Trends in shipments and value, by size groups, are shown in figure 6.

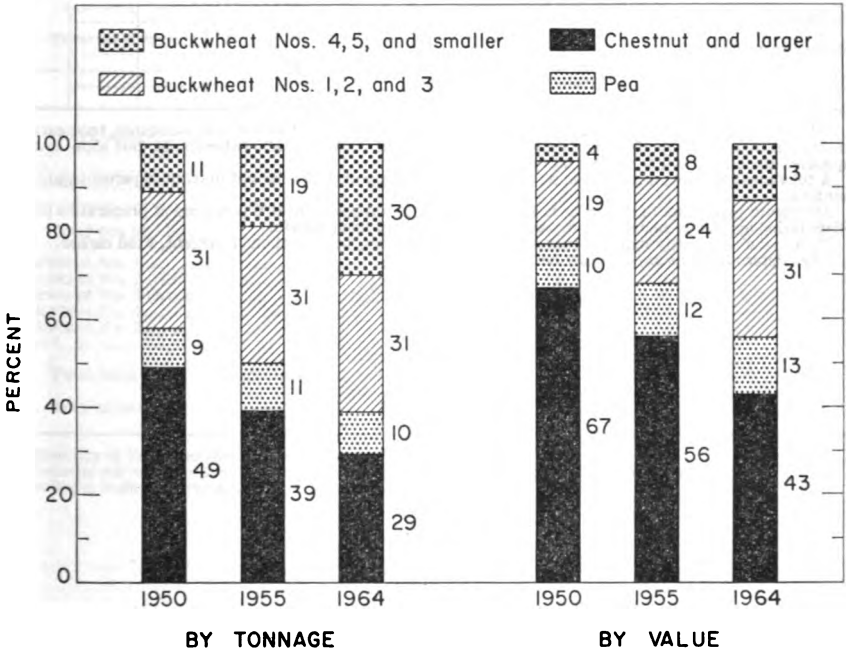


FIGURE 6. —Shipments of Pennsylvania anthracite, 1950, 1955, and 1964, by size groups, in percent of total tonnage and total value.

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**TABLE 22.—Standard anthracite specifications approved and adopted by the Anthracite Committee, effective July 28, 1947**

| Size | Round test mesh (inches) | Percent | | | | | |
|---|---|---|---|---|---|---|---|
| | | Oversize maximum | Undersize | | Maximum impurities[1] | | |
| | | | Maximum | Minimum | Slate | Bone | Ash[2] |
| Broken | Through 4⅜ | | | | 1½ | 2 | 11 |
| | Over 3¼ to 3 | | 15 | 7½ | | | |
| Egg | Through 3¼ to 3 | 5 | | | 1½ | 2 | 11 |
| | Over 2⅜ | | 15 | 7½ | | | |
| Stove | Through 2⅜ | 7½ | | | 2 | 3 | 11 |
| | Over 1⅝ | | 15 | 7½ | | | |
| Chestnut | Through 1⅝ | 7½ | | | 3 | 4 | 11 |
| | Over 1¾ | | 15 | 7½ | | | |
| Pea | Through 1¾ | 10 | | | 4 | 5 | 12 |
| | Over ⅝ | | 15 | 7½ | | | |
| Buckwheat No. 1 | Through ⅝ | 10 | | | | | 13 |
| | Over ⅜ | | 15 | 7½ | | | |
| Buckwheat No. 2 (rice) | Through ⅜ | 10 | | | | | 13 |
| | Over ¾ | | 17 | 7½ | | | |
| Buckwheat No. 3 (barley) | Through ¾ | 10 | | | | | 15 |
| | Over 3/32 | | 20 | 10 | | | |
| Buckwheat No. 4 | Through 3/32 | 20 | | | | | 15 |
| | Over 3/64 | | 30 | 10 | | | |
| Buckwheat No. 5 | Through 3/64 | 30 | No limit | | | | 16 |

[1] When slate content in sizes from broken to chestnut, inclusive, is less than above standards, bone content may be increased by 1½ times the decrease in slate content under the allowable limits, but slate content specified above shall not be exceeded in any event.

A tolerance of 1 percent is allowed on maximum percentage of undersize and maximum percentage of ash content.

Maximum percentage of undersize is applicable only to anthracite as it is produced at preparation plant.

Slate is defined as any material that has less than 40 percent fixed carbon.

Bone is defined as any material that has 40 percent or more, but less than 75 percent, fixed carbon.

[2] Ash determinations are on a dry basis.

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**TABLE 23.—Average sales realization per net ton of Pennsylvania anthracite at preparation plants in 1964, by regions and sizes**

(Excludes dredge coal)

| Size | Lehigh region | | | Schuylkill region | | |
|---|---|---|---|---|---|---|
| | Shipped by rail | Shipped by truck | Total | Shipped by rail | Shipped by truck | Total |
| Lump [1] and broken | | | | $13.76 | $13.77 | $13.76 |
| Egg | $13.06 | $12.88 | $13.04 | 12.92 | 12.91 | 12.92 |
| Stove | 13.39 | 13.45 | 13.41 | 12.85 | 12.33 | 12.59 |
| Chestnut | 13.32 | 13.53 | 13.44 | 12.85 | 12.29 | 12.52 |
| Pea | 10.75 | 11.15 | 11.06 | 10.42 | 10.03 | 10.18 |
| Total pea and larger | 13.02 | 12.53 | 12.78 | 12.31 | 11.66 | 11.96 |
| Buckwheat No. 1 | 9.48 | 9.78 | 9.68 | 9.68 | 9.19 | 9.42 |
| Buckwheat No. 2 (rice) | 9.77 | 10.08 | 10.00 | 8.92 | 9.01 | 8.99 |
| Buckwheat No. 3 (barley) | 7.29 | 7.15 | 7.21 | 6.88 | 6.87 | 6.87 |
| Buckwheat No. 4 | 5.22 | 5.62 | 5.33 | 5.10 | 4.81 | 4.98 |
| Buckwheat No. 5 | 5.20 | 4.96 | 5.17 | 4.67 | 3.83 | 4.43 |
| Other [2] | 3.39 | 2.96 | 3.16 | 3.22 | 3.52 | 3.37 |
| Total buckwheat No. 1 and smaller | 6.10 | 7.62 | 6.85 | 5.94 | 6.56 | 6.25 |
| Total all sizes | 8.84 | 9.56 | 9.19 | 8.07 | 8.47 | 8.28 |

| Size | Wyoming region [3] | | | Total | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Lump [1] and broken | $12.42 | $12.41 | $12.42 | $12.69 | $13.46 | $12.84 |
| Egg | 12.90 | 12.95 | 12.90 | 12.94 | 12.91 | 12.94 |
| Stove | 13.06 | 13.04 | 13.06 | 13.06 | 12.65 | 12.92 |
| Chestnut | 13.14 | 13.24 | 13.18 | 13.05 | 12.81 | 12.92 |
| Pea | 11.17 | 11.54 | 11.42 | 10.74 | 10.87 | 10.82 |
| Total pea and larger | 12.81 | 12.46 | 12.67 | 12.66 | 12.08 | 12.38 |
| Buckwheat No. 1 | 9.76 | 10.22 | 10.04 | 9.68 | 9.70 | 9.69 |
| Buckwheat No. 2 (rice) | 9.63 | 9.78 | 9.73 | 9.31 | 9.48 | 9.43 |
| Buckwheat No. 3 (barley) | 6.91 | 6.98 | 6.93 | 6.97 | 6.95 | 6.95 |
| Buckwheat No. 4 | 5.21 | 5.26 | 5.22 | 5.15 | 5.00 | 5.10 |
| Buckwheat No. 5 | 4.92 | 5.06 | 4.95 | 4.84 | 4.06 | 4.66 |
| Other [2] | | 1.87 | 1.87 | 3.26 | 2.68 | 2.88 |
| Total buckwheat No. 1 and smaller | 7.75 | 6.46 | 6.97 | 6.37 | 6.72 | 6.56 |
| Total all sizes | 10.81 | 8.85 | 9.82 | 9.08 | 8.79 | 8.93 |

[1] Quantity of lump included is insignificant.
[2] Includes various mixtures of buckwheat Nos. 2 to 5 and coal of relatively low dollar value.
[3] Includes Sullivan County.

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**TABLE 24.—Average sales realization per net ton of Pennsylvania anthracite at preparation plants, by regions and sizes**

(Excludes dredge coal)

| Size | Lehigh region | | | | | Schuylkill region | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1960 | 1961 | 1962 | 1963 | 1964 | 1960 | 1961 | 1962 | 1963 | 1964 |
| Lump [1] and broken | | $11.29 | | | | $10.62 | $10.96 | $11.34 | $12.62 | $13.76 |
| Egg | $10.23 | 10.79 | $11.02 | $11.75 | $13.04 | 10.23 | 10.39 | 11.01 | 11.81 | 12.92 |
| Stove | 10.59 | 11.14 | 11.46 | 12.28 | 13.41 | 10.39 | 10.69 | 10.93 | 11.92 | 12.59 |
| Chestnut | 10.98 | 11.52 | 11.77 | 12.39 | 13.44 | 10.56 | 10.80 | 10.97 | 11.86 | 12.52 |
| Pea | 9.44 | 9.22 | 9.36 | 9.89 | 11.06 | 8.59 | 8.66 | 8.80 | 9.63 | 10.18 |
| Total pea and larger | 10.41 | 10.75 | 10.92 | 11.57 | 12.78 | 9.97 | 10.19 | 10.36 | 11.28 | 11.95 |
| Buckwheat No. 1 | 8.75 | 8.24 | 8.03 | 8.76 | 9.68 | 8.14 | 7.99 | 8.09 | 8.78 | 9.42 |
| Buckwheat No. 2 (rice) | 9.29 | 8.99 | 8.80 | 9.25 | 10.00 | 7.99 | 7.94 | 7.99 | 8.63 | 8.99 |
| Buckwheat No. 3 (barley) | 7.25 | 6.89 | 6.68 | 6.74 | 7.21 | 6.76 | 6.62 | 6.54 | 6.67 | 6.87 |
| Buckwheat No. 4 | 5.05 | 4.88 | 4.94 | 4.97 | 5.33 | 4.88 | 4.76 | 4.58 | 4.70 | 4.96 |
| Buckwheat No. 5 | 4.89 | 4.70 | 4.94 | 4.86 | 5.17 | 4.23 | 4.21 | 4.16 | 4.12 | 4.43 |
| Other [2] | 1.77 | 1.86 | 2.02 | 3.00 | 3.16 | 2.90 | 2.99 | 3.45 | 3.25 | 3.37 |
| Total buckwheat No. 1 and smaller | 5.82 | 6.10 | 5.45 | 5.89 | 6.85 | 6.00 | 5.82 | 5.95 | 6.16 | 6.25 |
| Total all sizes | 7.60 | 7.98 | 7.48 | 7.81 | 9.19 | 7.50 | 7.51 | 7.68 | 8.12 | 8.26 |

| Size | Wyoming region [3] | | | | | Total | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1960 | 1961 | 1962 | 1963 | 1964 | 1960 | 1961 | 1962 | 1963 | 1964 |
| Lump [1] and broken | $11.20 | $11.50 | $11.06 | $11.72 | $12.42 | $10.87 | $11.29 | $11.18 | $12.10 | $12.84 |
| Egg | 10.42 | 11.08 | 11.21 | 12.19 | 12.90 | 10.31 | 10.84 | 11.13 | 12.03 | 12.94 |
| Stove | 10.74 | 11.57 | 11.59 | 12.42 | 13.06 | 10.56 | 11.10 | 11.29 | 12.19 | 12.92 |
| Chestnut | 11.23 | 11.96 | 11.98 | 12.62 | 13.18 | 10.89 | 11.36 | 11.49 | 12.24 | 12.92 |
| Pea | 10.64 | 10.87 | 10.60 | 10.83 | 11.42 | 9.57 | 9.65 | 9.63 | 10.15 | 10.82 |
| Total pea and larger | 10.90 | 11.51 | 11.42 | 12.06 | 12.67 | 10.42 | 10.80 | 10.90 | 11.65 | 12.38 |
| Buckwheat No. 1 | 8.92 | 9.34 | 8.86 | 9.51 | 10.04 | 8.54 | 8.55 | 8.39 | 9.06 | 9.69 |
| Buckwheat No. 2 (rice) | 9.09 | 9.24 | 8.95 | 9.41 | 9.73 | 8.56 | 8.55 | 8.47 | 9.00 | 9.43 |
| Buckwheat No. 3 (barley) | 7.16 | 7.15 | 6.77 | 6.53 | 6.93 | 6.95 | 6.83 | 6.64 | 6.64 | 6.95 |
| Buckwheat No. 4 | 5.19 | 5.15 | 5.30 | 5.60 | 5.22 | 4.95 | 4.85 | 4.78 | 4.90 | 5.10 |
| Buckwheat No. 5 | 4.78 | 4.90 | 4.61 | 4.77 | 4.95 | 4.43 | 4.43 | 4.41 | 4.44 | 4.66 |
| Other [2] | 2.54 | 2.18 | 2.22 | 1.92 | 1.87 | 2.52 | 2.64 | 2.62 | 2.94 | 2.88 |
| Total buckwheat No. 1 and smaller | 7.00 | 7.41 | 6.94 | 7.46 | 6.97 | 6.27 | 6.32 | 6.14 | 6.43 | 6.56 |
| Total all sizes | 8.92 | 9.54 | 9.26 | 9.94 | 9.82 | 8.01 | 8.26 | 8.19 | 8.64 | 8.93 |

[1] Quantity of lump included is insignificant.
[2] Includes various mixtures of buckwheat Nos. 2 to 5 and coal of relatively low dollar value.
[3] Includes Sullivan County.

**TABLE 25.—Average value per net ton of Pennsylvania anthracite from all sources, by regions [1]**

| Region | 1963 | | | | 1964 | | | |
|---|---|---|---|---|---|---|---|---|
| | Shipped by rail | Shipped by truck | Colliery fuel | Total | Shipped by rail | Shipped by truck | Colliery fuel | Total |
| Lehigh | $7.24 | $8.43 | $5.57 | $7.80 | $8.84 | $9.56 | $9.08 | $9.19 |
| Schuylkill | 7.18 | 8.33 | 7.58 | 7.76 | 7.47 | 8.30 | 8.20 | 7.88 |
| Wyoming [2] | 10.24 | 9.58 | 2.52 | 9.77 | 10.81 | 8.85 | 1.63 | 9.62 |
| Total | 8.20 | 8.72 | 3.05 | 8.40 | 8.71 | 8.70 | 2.42 | 8.65 |

[1] Value given for shipments is that at which coal left possession of producing company and does not include selling expenses.
[2] Includes Sullivan County.

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## EMPLOYMENT

Employment at anthracite operations continued to decline in 1964. Reports submitted to the Bureau on mine injuries and employment indicated that the average number of men working daily was 13,144, 3 percent less than in 1963.

Of the total number of men working daily in 1964, 40 percent were employed at underground mines; 14 percent in surface work at underground operations (including general shops); 23 percent at strip pits; 18 percent at preparation plants; 4 percent at culm banks; and, 1 percent on dredges. Notwithstanding the decrease of 12 percent in underground production, the average number of men working at deep mines (underground and surface) decreased only 5 percent. Employment at preparation plants decreased 2 percent and on river dredges 4 percent.

The average number of men working daily at strip pits and culm banks each increased 2 percent, despite the drop in production of 4 percent at strip pits and the increase of less than 1 percent at culm banks.

Of the total labor force, 50 percent was employed in the Schuylkill region, 36 percent in the Wyoming, and 14 percent in the Lehigh region. Employment declined in each of the regions as follows: Lehigh, 8 percent; Schuylkill, 2 percent; and Wyoming, 1 percent. The four major producing counties, Luzerne, Schuylkill, Northumberland, and Lackawanna provided work for 92 percent of the total labor force; employment was down 2 percent in both Luzerne and Northumberland Counties, 7 percent in Schuylkill, but up 2 percent in Lackawanna County.

Anthracite operations were active an average of 214 days in 1964—2 less than in 1963. In the Wyoming region, operations were active an average of 230 days; in the Schuylkill region, 208 days; in the Lehigh region, 194 days. The reduced labor force worked a total of 2,812,000 man-days. The productivity rate was 6.11 tons per man-day, down from the record high of 6.27 tons set in 1963. Details on the number of men employed, days worked, man-days of labor, and productivity rates are presented in table 26. The labor force is shown by counties in table 27.

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**TABLE 26.—Men employed, days worked, man-days of labor, and output per man per day at operations producing Pennsylvania anthracite in 1964**

(Includes operations of strip contractors)

| | Lehigh region | Schuylkill region | Wyoming region [1] | Total | |
|---|---|---|---|---|---|
| | | | | 1964 | 1963 |
| Average number of men working daily: | | | | | |
| Underground | 84 | 2,757 | 2,352 | 5,193 | 5,449 |
| In strip pits | 974 | 1,393 | 708 | 3,075 | 3,025 |
| At culm banks | 206 | 215 | 153 | 574 | 563 |
| At preparation plants | 534 | 1,262 | 617 | 2,413 | 2,473 |
| Other surface | 85 | 862 | 834 | 1,781 | 1,876 |
| Total excluding dredge operations | 1,883 | 6,489 | 4,664 | 13,036 | 13,386 |
| Dredge operations | | 108 | | 108 | 112 |
| Total | 1,883 | 6,597 | 4,664 | 13,144 | 13,498 |
| Average number of days active: | | | | | |
| All operations except dredges | 194 | 208 | 230 | 214 | 216 |
| Dredge operations | | 245 | | 245 | 231 |
| Average, all operations | 194 | 208 | 230 | 214 | 216 |
| Man days of labor: | | | | | |
| All operations except dredges | 365,590 | 1,346,503 | 1,073,310 | 2,785,403 | 2,885,954 |
| Dredge operations | | 26,451 | | 26,451 | 25,835 |
| Total, all operations | 365,590 | 1,372,954 | 1,073,310 | 2,811,854 | 2,911,789 |
| Average tons per man-day: | | | | | |
| All operations except dredges | 8.72 | 6.01 | 4.85 | 5.92 | 6.09 |
| Dredge operations | | 26.66 | | 26.66 | 26.77 |
| Average all operations | 8.72 | 6.53 | 4.85 | 6.11 | 6.27 |

[1] Includes Sullivan County.

**TABLE 27.—Men employed at operations producing Pennsylvania anthracite, by counties**

(Includes operations of strip contractors)

| County | 1963 | 1964 | County | 1963 | 1964 |
|---|---|---|---|---|---|
| Berks, Lancaster, Lebanon, and Snyder | 99 | 96 | Northumberland | 1,912 | 1,881 |
| Carbon | 343 | 258 | Schuylkill | 4,873 | 4,537 |
| Columbia | 307 | 456 | Sullivan | 11 | 20 |
| Dauphin | 181 | 179 | Wayne | 2 | 5 |
| Lackawanna | 1,086 | 1,107 | Total | 13,498 | 13,144 |
| Luzerne | 4,684 | 4,605 | | | |

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## DISTRIBUTION

Reports submitted voluntarily to the Bureau of Mines by producers, wholesalers, and exporting firms, showed that 15,705,000 net tons of Pennsylvania anthracite was shipped during the 1963–64 coal year (April 1–March 31). Where possible, high-ash coal of low-dollar value, used largely as colliery fuel or for generation of electricity, was eliminated from the statistics. Of the total shipped to market during the year, about 75 percent was destined to points in the United States, 4 percent to Canada, and the remainder to overseas countries. Compared with 1962–63 coal-year, total shipments were up about 3 percent, with declines of 8 percent in the United States and 17 percent in exports to Canada. However, exports abroad doubled—rising from 1,666,000 tons in the 1962–63 coal year to 3,340,000 tons—as the result of continued shipments to U.S. Armed Forces in West Germany and sharply increased demand in Western Europe.

By size, shipments of pea and larger declined less than 1 percent, but buckwheat No. 1 and smaller sizes, as a group, rose 6 percent. In the United States demand for pea and larger sizes was 14 percent below 1962–63 coal-year levels, and in Canada, 20 percent lower. These losses were balanced by the increase of 75 percent in overseas exports of these sizes. The distribution pattern for the smaller sizes differed markedly, however, as shipments of buckwheat No. 1 and smaller registered a gain of 156 percent in overseas markets, while dropping 4 percent in the United States and 9 percent in Canada. Despite the sharp gain in exports of the smaller sizes, of greater importance to the producing industry was the fact that 60 percent of European imports consisted of the higher-priced large sizes. West Germany led all European countries with 908,000 tons (including coal shipped to U.S. Armed Forces), followed by France, Netherlands, Belgium-Luxembourg, and Italy in that order.

Because of the 14 percent increase in rail traffic (due entirely to increased exports) and the 9 percent decrease in reported truck shipments, rail shipments accounted for 58 percent of the coal-year total, compared with 53 percent in the 1962–63 year. Truck shipments fell from 47 percent to 42 percent in 1963–64. Data on the distribution of anthracite during the coal year 1963–64 are presented in table 28.

According to data released by the Pennsylvania Department of Mines and Mineral Industries, both rail and truck shipments declined in calendar year 1964—by 7 percent and slightly more than 1 percent, respectively. Rail shipments to the New England States, New York, New Jersey, and Delaware all decreased, whereas shipments to the other States increased from 7 percent for the "Other States" category to 175 percent for Indiana. The decline in exports to Canada amounted to 134,000 tons, and exports to other countries were off 510,000 tons, chiefly because of the decrease to European countries. Shipments by truck to markets in the producing region remained virtually the same whereas those in Pennsylvania markets outside the producing region increased 4 percent. The District of Columbia

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**TABLE 28.—Distribution of Pennsylvania anthracite, April 1, 1963 to March 31, 1964, by States, Provinces, and countries of destination in net tons**

| Destinations | Pea and larger | | | | | | Buckwheat No. 1 and smaller | | | | | Total all sizes | Percent of total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Broken | Egg | Stove | Chestnut | Pea | Total | Buckwheat No. 1 | Buckwheat No. 2 (rice) | Buckwheat No. 3 (barley) | Other | Total | | |
| United States: | | | | | | | | | | | | | |
| New England States: | | | | | | | | | | | | | |
| Connecticut | | 983 | 22,285 | 27,282 | 1,629 | 52,179 | 3,225 | 5,719 | 6,265 | 90 | 15,299 | 67,478 | 0.4 |
| Maine | | 1,674 | 20,313 | 19,505 | 433 | 41,925 | 3,924 | 7,849 | | 1 | 11,774 | 53,699 | .4 |
| Massachusetts | | 11,045 | 111,650 | 66,499 | 7,537 | 196,731 | 28,664 | 29,665 | 6,130 | 290 | 64,749 | 261,480 | 1.7 |
| New Hampshire | | 1,227 | 13,147 | 10,552 | 770 | 25,696 | 2,790 | 6,743 | | 334 | 9,867 | 35,563 | .2 |
| Rhode Island | | 288 | 6,249 | 5,697 | 338 | 12,572 | 3,986 | 927 | 14 | 121 | 5,048 | 17,620 | .1 |
| Vermont | | 2,934 | 19,080 | 15,421 | 2,960 | 40,395 | 11,718 | 16,109 | | | 27,827 | 68,222 | .4 |
| Total | | 18,151 | 192,724 | 144,956 | 13,667 | 369,498 | 54,307 | 67,012 | 12,409 | 836 | 134,564 | 504,062 | 3.2 |
| Middle Atlantic States: | | | | | | | | | | | | | |
| New Jersey | 572 | 3,511 | 130,634 | 283,994 | 73,860 | 492,571 | 107,501 | 146,089 | 207,083 | 283,106 | 743,779 | 1,236,350 | 7.9 |
| New York | | 25,736 | 343,380 | 321,064 | 449,925 | 1,140,105 | 400,235 | 213,733 | 266,472 | 284,211 | 1,164,651 | 2,304,756 | 14.7 |
| Pennsylvania [1] | 742 | 31,957 | 484,313 | 1,049,797 | 876,023 | 2,442,832 | 1,002,052 | 926,771 | 1,123,085 | 1,041,665 | 4,093,573 | 6,536,405 | 41.6 |
| Total | 1,314 | 61,204 | 958,327 | 1,654,855 | 1,399,808 | 4,075,508 | 1,509,788 | 1,286,593 | 1,596,640 | 1,608,982 | 6,002,003 | 10,077,511 | 64.2 |
| South Atlantic States: [2] | | | | | | | | | | | | | |
| Delaware | | 5,177 | 10,884 | 27,595 | 598 | 44,254 | 978 | 2,838 | 2,018 | 570 | 6,404 | 50,658 | .3 |
| District of Columbia | | 337 | 11,293 | 9,959 | 699 | 22,288 | 4,157 | 572 | 571 | 1,054 | 6,354 | 28,642 | .2 |
| Maryland | | 666 | 47,026 | 41,021 | 3,797 | 92,510 | 19,280 | 2,631 | 1,200 | 238,038 | 261,149 | 353,659 | 2.2 |
| Virginia | | 54 | 5,610 | 3,948 | 1,623 | 11,235 | 1,828 | 191 | 31 | 540 | 2,590 | 13,825 | .1 |
| Total | | 6,234 | 74,813 | 82,523 | 6,717 | 170,287 | 26,243 | 6,232 | 3,820 | 240,202 | 276,497 | 446,784 | 2.8 |
| Lake States: [3] | | | | | | | | | | | | | |
| Illinois | 42 | 17 | 1,578 | 3,814 | 246 | 5,697 | 27,439 | 10,682 | 3,415 | 24,395 | 65,931 | 71,628 | .5 |
| Michigan | | 45 | 3,593 | 2,574 | 378 | 6,590 | 9,171 | 4,736 | 29 | 77,650 | 91,586 | 98,176 | .6 |
| Minnesota | | | 279 | 566 | 217 | 1,062 | 504 | 30 | 49 | 8,313 | 8,896 | 9,958 | .1 |
| Ohio | | 75 | 135 | 1,742 | 197 | 2,149 | 38,532 | 6,881 | 16,311 | 120,237 | 181,961 | 184,110 | 1.2 |
| Wisconsin | | | 11,314 | 12,977 | 703 | 24,994 | 972 | 1,163 | 22 | 11,368 | 13,525 | 38,519 | .2 |
| Total | 42 | 137 | 16,899 | 21,673 | 1,741 | 40,492 | 76,618 | 23,492 | 19,826 | 241,963 | 361,899 | 402,391 | 2.6 |
| Other States | | 1,861 | 502 | 7,656 | 9,776 | 19,795 | 41,275 | 8,683 | 20,583 | 183,999 | 254,540 | 274,335 | 1.7 |
| Total United States | 1,356 | 87,587 | 1,243,265 | 1,911,663 | 1,431,709 | 4,675,580 | 1,708,231 | 1,392,012 | 1,653,278 | 2,275,982 | 7,029,503 | 11,705,083 | 74.5 |

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| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Canada: | | | | | | | | | | | | | | |
| Ontario | | 6,707 | 151,519 | 148,126 | 41,207 | 347,559 | 51,869 | 20,060 | 672 | 2,740 | 75,341 | 422,900 | 2.7 |
| Quebec | | 1,536 | 39,922 | 30,686 | 1,650 | 73,794 | 38,332 | 10,860 | 88,681 | 11,916 | 149,788 | 223,862 | 1.4 |
| Other Provinces | | 636 | 3,577 | 3,393 | 3 | 7,609 | 4 | 966 | 3,424 | 1,491 | 5,885 | 13,494 | .1 |
| Total Canada | | 8,879 | 195,018 | 182,205 | 42,860 | 428,962 | 90,205 | 31,886 | 92,777 | 16,146 | 231,014 | 659,976 | 4.2 |
| Other countries | 156 | 380,393 | 768,557 | 465,755 | 380,819 | 2,001,680 | 341,419 | 102,464 | 174,199 | 720,392 | 1,338,474 | 3,340,154 | 21.3 |
| Grand total | 1,512 | 482,869 | 2,206,940 | 2,559,623 | 1,855,388 | 7,106,222 | 2,139,855 | 1,526,362 | 1,920,264 | 3,012,520 | 8,596,991 | 16,705,213 | 100.0 |

[1] Includes "Local Sales."
[2] Shipments to other States in the South Atlantic area are included in "Other States."
[3] Shipments to Indiana are included in "Other States."

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was the only other trucking market showing an increase. Truck data for 1964 by months are shown in table 29, rail and truck shipments for the period 1960–64 are shown in tables 30 and 31.

**TABLE 29.—Truck shipments of Pennsylvania anthracite in 1964, by months, and by States of destination, in net tons [1]**

| Destination | January | February | March | April | May | June | July |
|---|---|---|---|---|---|---|---|
| Pennsylvania: | | | | | | | |
| Within region | 381,213 | 339,871 | 279,957 | 268,162 | 226,939 | 242,382 | 180,494 |
| Outside region | 329,393 | 298,583 | 253,469 | 280,191 | 261,952 | 263,352 | 194,339 |
| New York | 83,089 | 79,103 | 49,768 | 57,763 | 54,306 | 59,683 | 42,122 |
| New Jersey | 58,534 | 48,563 | 32,538 | 42,449 | 46,576 | 48,092 | 24,858 |
| Delaware | 6,258 | 4,170 | 2,647 | 1,799 | 3,632 | 2,786 | 168 |
| Maryland | 12,171 | 10,635 | 5,790 | 4,853 | 4,424 | 4,167 | 2,872 |
| District of Columbia | 288 | 1,012 | 928 | 126 | 86 | 159 | 198 |
| Other States | 2,888 | 3,782 | 2,458 | 1,037 | 1,938 | 2,779 | 1,620 |
| Total: 1964 | 873,834 | 785,719 | 627,555 | 656,380 | 599,853 | 624,000 | 446,671 |
| 1963 | 1,006,651 | 904,393 | 727,823 | 508,102 | 574,556 | 548,756 | 428,887 |

| Destination | August | September | October | November | December | Total | Percent of total trucked |
|---|---|---|---|---|---|---|---|
| Pennsylvania: | | | | | | | |
| Within region | 225,348 | 225,146 | 251,699 | 262,592 | 347,530 | 3,231,333 | 41.1 |
| Outside region | 268,911 | 305,674 | 264,555 | 235,216 | 328,586 | 3,284,221 | 41.8 |
| New York | 55,170 | 49,100 | 54,520 | 43,302 | 64,061 | 691,987 | 8.8 |
| New Jersey | 31,472 | 38,898 | 41,901 | 33,735 | 52,705 | 500,921 | 6.4 |
| Delaware | 895 | 1,957 | 2,549 | 2,696 | 4,462 | 34,019 | .4 |
| Maryland | 4,500 | 6,714 | 7,147 | 5,998 | 8,956 | 78,227 | 1.0 |
| District of Columbia | 326 | 148 | 353 | 455 | 1,000 | 5,079 | .1 |
| Other States | 4,599 | 4,177 | 4,327 | 3,029 | 3,436 | 36,070 | .4 |
| Total: 1964 | 591,221 | 631,814 | 627,051 | 587,023 | 810,736 | 7,861,857 | 100.0 |
| 1963 | 527,612 | 613,110 | 676,370 | 659,477 | 794,369 | 7,970,106 | 100.0 |

[1] Compiled from reports of Pennsylvania Department of Mines and Mineral Industries; does not include dredge coal.

**TABLE 30.—Rail shipments of Pennsylvania anthracite, by destinations, in net tons [1]**

| Destination | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| New England States | 712,780 | 602,262 | 465,535 | 407,194 | 381,380 |
| New York | 2,458,043 | 2,267,861 | 1,939,004 | 1,515,786 | 1,317,443 |
| New Jersey | 988,852 | 826,323 | 858,587 | 675,159 | 640,969 |
| Pennsylvania | 2,236,964 | 2,275,481 | 2,309,182 | 2,001,932 | 2,209,434 |
| Delaware | 48,586 | 42,194 | 21,373 | 16,630 | 12,002 |
| Maryland | 167,355 | 255,658 | 182,222 | 207,904 | 230,209 |
| District of Columbia | 22,024 | 19,561 | 15,983 | 14,982 | 19,008 |
| Virginia | 17,524 | 14,158 | 18,876 | 10,613 | 12,373 |
| Ohio | 165,903 | 174,620 | 165,211 | 138,546 | 162,154 |
| Indiana | 44,763 | 46,650 | 29,754 | 26,306 | 72,358 |
| Illinois | 91,640 | 76,348 | 75,435 | 77,548 | 102,438 |
| Wisconsin | 60,737 | 59,815 | 41,322 | 24,562 | 29,408 |
| Minnesota | 13,032 | 8,636 | 6,304 | 8,394 | 21,492 |
| Michigan | 50,835 | 55,218 | 43,028 | 35,377 | 50,964 |
| Other States | 154,586 | 121,119 | 190,028 | 217,351 | 231,842 |
| Total United States | 7,233,624 | 6,845,904 | 6,361,844 | 5,378,284 | 5,493,474 |
| Canada | 1,067,181 | 890,058 | 713,336 | 647,437 | 513,061 |
| Other foreign countries | 68,875 | 82,636 | 516,376 | 1,953,671 | 1,443,751 |
| Grand total | 8,369,680 | 7,818,598 | 7,591,556 | 7,979,392 | 7,450,286 |

[1] Compiled from reports of Pennsylvania Department of Mines and Mineral Industries; does not include dredge coal.

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**TABLE 31.—Truck shipments of Pennsylvania anthracite, by destinations, in net tons [1]**

| Destination | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Pennsylvania: | | | | | |
| Within region | 3,826,445 | 3,744,781 | 3,471,725 | 3,227,838 | 3,231,333 |
| Outside region | 2,900,414 | 2,891,607 | 2,915,220 | 3,155,875 | 3,284,221 |
| New York | 1,217,342 | 1,194,765 | 844,447 | 870,186 | 691,987 |
| New Jersey | 548,678 | 641,329 | 591,905 | 547,333 | 500,921 |
| Delaware | 48,221 | 45,310 | 43,863 | 37,465 | 34,019 |
| Maryland | 103,381 | 92,837 | 92,249 | 89,995 | 78,227 |
| District of Columbia | 6,232 | 5,753 | 6,573 | 4,443 | 5,079 |
| Other States | 17,703 | 26,169 | 32,214 | 36,971 | 36,070 |
| Total | 8,668,416 | 8,642,551 | 7,998,196 | 7,970,106 | 7,861,857 |

[1] Compiled from reports of Pennsylvania Department of Mines and Mineral Industries; does not include dredge coal.

The tonnage of anthracite moving over Lake Erie docks increased from 192,000 net tons in 1963 to 217,000 tons in 1964, but decreased 19,000 tons over Lake Ontario docks. Receipts were about 15,000 tons greater at Duluth-Superior. At Upper-Lake docks, receipts were 6,000 tons higher on Lake Superior, but declined about 8,000 tons at Lake Michigan. The exdock movement to inland points increased on Lake Superior but decreased on Lake Michigan. Detailed data on the Lake-dock trade in Pennsylvania anthracite are shown in table 2.

## CONSUMPTION

Apparent consumption of Pennsylvania anthracite in the United States in 1964, calculated as production minus exports (including coal shipped to West Germany for the use of U.S. Armed Forces), totaled 14.4 million net tons—a gain of 2 percent. This is the first year since 1956 to show an increase in consumption. Although use data on anthracite are incomplete, the larger part of the gain apparently was attributable to increased demand for the smaller industrial sizes. Demand by the major European countries for imports of American anthracite declined drastically (see table 34). Exports to Canada again showed a decrease (20 percent), and deliveries by United States retail dealers outside the producing region were approximately 18 percent below the 1963 volume.

Consumption of Pennsylvania anthracite at electric-utility plants increased, as the total for 1964 (2,239,000 tons) represented a gain of 5 percent. Data for the iron and steel industry are incomplete as no data are available for miscellaneous purposes. However, anthracite used for coke making increased about 41,000 tons, and that used for sintering and pelletizing, 248,000 tons. Consumption at cement plants dropped about 31,000 tons, and the amount used as colliery fuel also decreased (17,000 tons).

Consumption of Pennsylvania anthracite by public utility and coke plants is shown, by months, in table 2. Apparent consumption of anthracite, heating and range oil and natural gas is shown in table 32 for the individual States comprising the primary anthracite marketing area. Historical data on retail-dealer deliveries, and consumption for certain industrial purposes are presented in table 33.

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**TABLE 32.—Apparent consumption of anthracite, heating and range oil, and natural gas, in the principal anthracite markets**

(Thousand net tons)

| Fuel | New England | New York | New Jersey | Pennsylvania | Delaware | Maryland | District of Columbia | Total | Percent of total fuels |
|---|---|---|---|---|---|---|---|---|---|
| Anthracite (all users): [1] | | | | | | | | | |
| 1961 | 602 | [2] 3,463 | [2] 1,468 | 8,912 | 88 | 348 | 25 | 14,906 | 10.5 |
| 1962 | 466 | [2] 2,783 | [2] 1,451 | 8,696 | 65 | 274 | 23 | 13,758 | 9.3 |
| 1963 | 407 | [2] 2,386 | [2] 1,223 | 8,386 | 54 | 298 | 19 | 12,773 | 8.6 |
| 1964 | 381 | [2] 2,009 | [2] 1,142 | 8,725 | 46 | 309 | 24 | 12,636 | 8.5 |
| Oil (heating and range): [3] | | | | | | | | | |
| 1961 | 32,087 | 30,285 | 11,581 | 11,018 | 873 | 4,224 | 1,015 | 91,083 | 64.0 |
| 1962 | 32,891 | 32,294 | 12,076 | 12,433 | 1,003 | 4,442 | 1,092 | 96,231 | 64.8 |
| 1963 | 31,783 | 32,154 | 12,829 | 12,519 | 1,148 | 4,506 | 1,167 | 96,106 | 64.4 |
| 1964 | 31,432 | 30,988 | 12,851 | 12,484 | 934 | 4,692 | 1,498 | 94,879 | 63.7 |
| Natural gas: [4] | | | | | | | | | |
| 1961 | 3,927 | 12,834 | 4,155 | 12,240 | 206 | 2,887 | ([5]) | 36,249 | 25.5 |
| 1962 | 4,298 | 13,590 | 4,551 | 12,685 | 228 | 3,086 | ([5]) | 38,438 | 25.9 |
| 1963 | 4,611 | 14,290 | 4,897 | 12,992 | 249 | 3,218 | ([5]) | 40,257 | 27.0 |
| 1964 | 4,850 | 14,499 | 5,303 | 13,080 | 262 | 3,397 | ([5]) | 41,391 | 27.8 |
| Total: | | | | | | | | | |
| 1961 | 36,616 | 46,582 | 17,204 | 32,170 | 1,167 | 7,459 | [6] 1,040 | 142,238 | 100.0 |
| 1962 | 37,655 | 48,667 | 18,078 | 33,814 | 1,296 | 7,802 | [6] 1,115 | 148,427 | 100.0 |
| 1963 | 36,801 | 48,830 | 18,949 | 33,897 | 1,451 | 8,022 | [6] 1,186 | 149,136 | 100.0 |
| 1964 | 36,663 | 47,496 | 19,296 | 34,289 | 1,242 | 8,398 | [6] 1,522 | 148,906 | 100.0 |

[1] Pennsylvania Department of Mines and Mineral Industries.
[2] Part of the anthracite shown as shipped to New Jersey is reshipped to New York.
[3] Converted to coal equivalent upon the basis of 4 barrels of fuel oil equaling 1 ton of coal.
[4] Converted to coal equivalent upon the basis of 24,190 cubic feet of natural gas equaling 1 ton of coal.
[5] District of Columbia included with Maryland.
[6] Natural gas for the District of Columbia included with Maryland.

**TABLE 33.—Retail dealer deliveries and consumption of Pennsylvania anthracite in the United States, 1955–64, by selected consumer categories**

(Thousand net tons)

| Year | Retail dealer deliveries [1] | Colliery fuel | Railroads [2] | Electric utilities [3] | Briquet plants | Cement plants | Iron and steel industry | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Coke making | Sintering and pelletizing [4] | Other [5] |
| 1955 | 13,019 | 419 | 457 | 3,209 | 264 | 199 | 366 | 385 | 443 |
| 1956 | 13,018 | 342 | 409 | 3,296 | 228 | 244 | 377 | 564 | 625 |
| 1957 | 10,670 | 279 | 361 | 3,363 | 156 | 221 | 389 | 868 | 698 |
| 1958 | 9,386 | 195 | 335 | 2,786 | 120 | 183 | 255 | 685 | 686 |
| 1959 | 7,562 | 129 | 292 | 2,629 | 43 | 159 | 369 | 780 | 683 |
| 1960 | 6,775 | 102 | 248 | 2,751 | 31 | 152 | 370 | 754 | 720 |
| 1961 | 5,070 | 45 | NA | 2,509 | 28 | 153 | 320 | 588 | 655 |
| 1962 | 4,767 | 152 | NA | 2,297 | ([6]) | 188 | 420 | 560 | 609 |
| 1963 | 4,055 | 161 | NA | 2,155 | ([6]) | 184 | 451 | 766 | 670 |
| 1964 | 3,334 | 144 | NA | 2,239 | ([6]) | 153 | 492 | 1,014 | NA |

NA Not available.
[1] Estimated from reports submitted by a selected list of retail dealers. Does not include local sales.
[2] Association of American Railroads.
[3] Federal Power Commission.
[4] Annual Statistical Report, American Iron and Steel Institute.
[5] Annual Statistical Report, American Iron and Steel Institute. Contains a small but not exactly determined amount of anthracite used for sintering.
[6] Concealed to avoid disclosure of individual company data.

## STOCKS

Data on producer stocks were discontinued with October 1962, at which time only 124,000 tons were in ground storage at the mines. For many decades, the anthracite industry traditionally stored mil-

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lions of tons of prepared coal in the producing region to satisfy a demand that normally far exceeded production during the winter months. However, with the long-term decline for its product and increased costs of storing coal, the industry has so reduced its mine-storage capacity that today it apparently lacks the flexibility to meet sudden, unexpected demand for large tonnages—particularly of a single size, or a narrow range of sizes.

Retail dealers, either in anticipation of increased exports or fear of a recurrence of the severe winter of 1962–63 increased their stocks over 1963. These increases ranged from 10,000 tons in January to 128,000 tons in June. The only months registering a slight decrease were March and November. Yearend stocks were 50,000 tons higher than 1963.

Public utilities again decreased their stocks but increased consumption by 100,000 tons. At the close of the year the utilities reported stocks at 1,247,000 tons, 4 percent below the 1963 year-end figure. Coke plants increased their stocks by 14 percent. Stocks on the Upper Lake Docks decreased drastically, with stocks at Lake Michigan docks down by 83 percent and at Lake Superior by 24 percent.

## FOREIGN TRADE

Data released by the Bureau of the Census, U.S. Department of Commerce, indicate that 1,575,000 net tons of Pennsylvania anthracite was exported in 1964, a decrease of 53 percent from 1963. The entire loss was attributable to substantial decreases in Western Europe and Canada, minor gains in Asia were offset by declines in exports to South America, Africa, and Oceania.

Census export data in table 34 show that 862,000 tons of anthracite were shipped to Europe in 1964, a decrease of 66 percent from the 1963 figure. However, this does not fully reflect the total movement of anthracite to the Continent, because the Bureau of the Census does not include in its figures coal shipped abroad for the use of U.S. Armed Forces. According to data furnished to the Bureau of Mines by the Association of American Railroads, almost 965,500 tons were dumped at tidewater piers for shipment to West Germany, and 396,700 tons were consigned to Netherlands. Of this amount, approximately 1,160,000 tons were intended for the use of U.S. Armed Forces in Germany. A more accurate measure of the importance of the export trade to the industry can be obtained, therefore, by adding this military tonnage to the Census data. Such an addition would show that about 2,022,000 tons were shipped to Europe. Also, the figure for total exports would approximate 2,736,000 tons.

Although no size data are available by calendar years, trade sources indicated the major part of exports in 1964 consisted of the larger sizes, thus helping the industry to absorb further losses in space-heating markets of the United States and Canada.

As indicated in footnote 9 to table 2, the Bureau of the Census discontinued issuing separate data on imports of anthracite beginning with September 1963. Since that date, the small quantities imported into the country have been combined with bituminous coal.

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## TABLE 34.—Anthracite exported from the United States, by countries and customs districts

(Net tons)

| Country | 1963 | 1964 |
|---|---|---|
| North America: | | |
| Canada | 794,585 | 636,867 |
| Canal Zone | 27 | ---- |
| Costa Rica | 48 | ---- |
| Dominican Republic | ---- | 76 |
| Haiti | 60 | 37 |
| Honduras | 13 | ---- |
| Jamaica | 122 | 46 |
| Mexico | 7,319 | 7,712 |
| Trinidad and Tobago | 158 | 69 |
| Total | 802,332 | 644,807 |
| South America: | | |
| Argentina | ---- | 4,424 |
| Brazil | 5,336 | 1,701 |
| Chile | 529 | 387 |
| Colombia | 54 | 341 |
| Peru | 1,193 | 32 |
| Surinam | 38 | 36 |
| Venezuela | 8,094 | 6,722 |
| Total | 15,244 | 13,643 |
| Europe: | | |
| Belgium-Luxembourg | r543,874 | 140,486 |
| Denmark | 50 | 54 |
| France | 723,964 | 291,796 |
| Germany, West | 52,163 | 679 |
| Italy | 259,946 | 208,313 |
| Netherlands | 829,118 | 201,071 |
| Spain | 93,791 | 19,183 |
| Sweden | 96 | ---- |
| United Kingdom | 334 | 439 |
| Yugoslavia | 155 | ---- |
| Total | r2,503,491 | 862,021 |
| Asia: | | |
| India | 3,269 | 2,268 |
| Indonesia | ---- | 77 |
| Iran | 275 | 39 |
| Israel | 10,867 | 8,385 |
| Japan | 3,714 | 11,351 |
| Korea, Republic | ---- | 47 |
| Pakistan | ---- | 49 |
| Philippines | 277 | 120 |
| Saudi Arabi | ---- | 30 |
| Viet-Nam | 14,583 | 29,385 |
| Total | 32,985 | 51,751 |
| Africa: | | |
| Kenya | ---- | 565 |
| Rhodesia and Malawi | ---- | 43 |
| Tunisia | 792 | ---- |
| Total | 792 | 608 |
| Oceania: | | |
| Australia | 2,433 | 2,267 |
| New Zealand | 63 | ---- |
| Total | 2,496 | 2,267 |
| Grand total | r3,357,340 | 1,575,097 |

| Customs district | 1963 | 1964 |
|---|---|---|
| North Atlantic: | | |
| Maine and New Hampshire | 128 | 50 |
| New York | 7,175 | 4,011 |
| Philadelphia | r2,672,468 | 1,095,655 |
| South Atlantic: | | |
| Maryland | 9,159 | 712 |
| Virginia | 1,476 | 533 |
| Gulf Coast: | | |
| Florida | 48 | ---- |
| Galveston | 2,750 | 3,313 |
| Mobile | 788 | ---- |
| New Orleans | 1,826 | 1,375 |
| Sabine | 481 | ---- |
| Mexican border: | | |
| Arizona | 146 | ---- |
| Laredo | 6,510 | 7,347 |
| Northern border: | | |
| Buffalo | 459,945 | 328,511 |
| Duluth and Superior | 1,167 | 2,077 |
| Michigan | 672 | 1,950 |
| Ohio | 1,688 | 3,073 |
| Rochester | 22,545 | 5,501 |
| St. Lawrence | 166,317 | 119,849 |
| Vermont | 1,524 | 870 |
| Pacific Coast: | | |
| Washington | 527 | 270 |
| Total | r3,357,340 | 1,575,097 |

r Revised.

Source: Bureau of the Census.

NOTE.—According to the Association of American Railroads, 2,005,763 net tons of anthracite was exported to Europe in 1964, compared with 3,210,156 tons in 1963. Of this total, 965,479 tons was consigned to West Germany and 396,710 to Netherlands, including shipments for the use of U.S. military forces in West Germany. This compares with 860,800 tons to West Germany and 847,598 tons to Netherlands for the same period in 1963.

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## WORLD PRODUCTION

World production of anthracite totaled 205.7 million tons in 1964 according to estimates and data reported by several sources, an increase of approximately 2 percent over the revised figure for 1963. In Europe, relatively small tonnage increases were reported for Belgium and the United Kingdom; however, the estimated increase of 1.2 million tons in West Germany placed the total for the Continent well above the 1963 output. Elsewhere, the most significant increases occurred in North and South Korea, with the latter almost doubling its production since 1960 with U.S. aid. Production in the United States decreased by more than 1 million tons. In the U.S.S.R., the largest anthracite-producing country in the world, output was estimated at 85 million tons in 1964, a gain of less than 1 percent. World production of anthracite for the 5-year period, 1960–64, is shown in table 35.

**TABLE 35.—World production of anthracite, by countries [1]**

(Thousand short tons)

| Country | 1960 | 1961 | 1962 | 1963 | 1964 » |
|---|---|---|---|---|---|
| Belgium | 8,815 | 8,210 | 8,406 | 8,562 | 8,710 |
| Bulgaria | 177 | 210 | 217 | 239 | e 220 |
| China e | 24,800 | 22,000 | 22,000 | 22,000 | 23,100 |
| France | 13,683 | 12,849 | 12,942 | 11,998 | e 11,400 |
| Germany: | | | | | |
| East e | 275 | 275 | 275 | 275 | 275 |
| West | 13,257 | 13,803 | 14,351 | 14,969 | 16,217 |
| Ireland | 143 | 129 | 146 | 144 | 160 |
| Italy | 22 | 26 | 18 | 15 | 10 |
| Japan | 1,987 | 2,088 | 2,065 | 1,982 | 1,884 |
| Korea: | | | | | |
| North e | 7,500 | 8,300 | 9,900 | 10,700 | 12,300 |
| South | 5,897 | 6,486 | 8,206 | 9,764 | 10,605 |
| Morocco | 454 | 452 | 408 | 445 | 441 |
| Netherlands e | 4,400 | 4,400 | 4,400 | 4,300 | 4,300 |
| New Zealand | 1 | (2) | 1 | (2) | (2) |
| Peru | 34 | 23 | 24 | 23 | 34 |
| Portugal | 480 | 518 | 446 | 459 | 489 |
| Rumania e | 17 | 17 | 17 | 17 | 17 |
| South Africa, Republic of | 709 | 1,429 | 1,224 | 1,270 | 1,449 |
| Spain | 2,771 | 2,863 | 2,913 | 3,057 | 2,918 |
| Switzerland e | 11 | 11 | 11 | 11 | 11 |
| U.S.S.R. | 85,995 | 85,405 | 84,175 | 84,530 | e 85,000 |
| United Kingdom | 4,026 | 3,973 | 4,371 | 4,658 | 5,150 |
| United States (Pennsylvania) | 18,817 | 17,446 | 16,894 | 18,267 | 17,184 |
| Vietnam: | | | | | |
| North | 2,860 | 3,118 | 3,823 | 3,715 | e 3,700 |
| South | 30 | 63 | 78 | 115 | 164 |
| World total (estimate) [1] | 197,200 | 194,100 | 197,300 | 201,500 | 205,700 |

e Estimate. » Preliminary.

[1] This table incorporates revisions of data published in previous anthracite chapters. Data do not add to totals shown because of rounding where estimated figures are included in the detail.

[2] Less than one half unit.

NOTE.—An undetermined amount of semianthracite is included in the figures for some countries.

## TECHNOLOGY

**Mining.**—Four of eight blocks were completed of a designed, half-replication experiment, with seven factors involved, in the operation of the Bureau's hydraulic miner. Data are evaluated as the blocks are completed. Factors considered are: Line pressure, water volume at the face, depth of round, number of mast set-ups, rate of nozzle

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travel, cutting pattern, and angle of jet impact. The effect of water infusion on the jet-cutting operation was investigated, but the tests proved negative under the conditions encountered.

Electro-mechanical equipment to automate movements of the hydraulic miner and jet-cutting, together with a depth-sensing device, was developed and installed by an outside concern. A malfunction was encountered in the jet-depth probe, which is being corrected. The automating equipment is undergoing permissibility tests at the Bureau's Pittsburgh testing station.

Tests with the Bureau-designed prototype hydraulic-hoisting system [3] were concluded with the completion of over 3,000 trial runs. The plant is being maintained in operating condition for demonstration purposes.

**Preparation.**—Investigations on the applicability of dense-media (magnetite) washing processes to the beneficiation of fine-sized anthracites were extended using blended and separate feeds of buckwheat No. 1, rice, and barley sizes. The data obtained show that separate washing of the three sizes resulted in maximum recovery of theoretical yields at high efficiencies. It was also found that as the size was decreased, misplaced material in the product and refuse increased, ash content rose, and efficiency fell. Test runs were made at 1.85, 1.80, and 1.70 sp. gr. Results are being evaluated.

Laboratory investigations on the preparation of low-ash anthracite during the first half of 1964 were confined to test runs with low-, medium, and high-volatile buckwheat No. 1 size anthracite. Original ash in the test samples varied from 7.3 percent in low-volatile samples to 9.0 percent in medium-volatile coal. With separating media varying from 1.36 to 1.55 sp. gr., the end product recovered varied from 16.5 percent, at 1.8 percent ash, for the high-volatile material to 18 percent, at 3.1 percent ash, for the medium-volatile samples. The low-volatile sample, however, yielded only a 5-percent recovery (2.5 percent ash) at 1.55 sp. gr.

A project was initiated to investigate the washability characteristics of Pennsylvania anthracite, and to systematically sample and assay the major anthracite beds to obtain the basic data needed to improve preparation plant design and processing methods. Work began with analyses of five samples from the Bottom Red Ash bed in the Northern field.

Research on developing a device for dewatering fine-sized anthracite was centered around an inverted conical spray chamber utilizing an upward-flowing air current to carry off the atomized moisture at varying air velocities and temperatures. Fluctuations observed in the reduction of moisture content and recovery will undergo further study.

**Properties.**—Research on the surface properties of anthracite continued with investigations on the use of nitrogen compared with carbon dioxide as low-temperature adsorbates in determining surface areas. The major portion of the work comprised running samples of Northern and Southern field anthracites which were unirradiated or vacuum irradiated, and exposed to $10^6$ rads gamma irradiation in air. Calculations using the four different forms of the BET equation

[3] Dierks, H. A., and H. B. Link. Development of a Lock-Hopper Feeder for Hydraulic Hoisting of Coal. BuMines Rept. of Inv. 6347, 1964, 27 pp.

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showed that by all forms of the equation, the specific surface of each anthracite exposed to $10^6$ rads gamma radiation in air had increased over the unirradiated or vacuum irradiated samples. Studies to date indicate that carbon dioxide appears to be a valid agent for determining the specific surface of coals. Plans include further studies with nitrogen to obtain data for comparison.

Research was concluded on the electrical resistivity of anthracite. A definite relationship was established between moisture and volatile content of the samples tested and their electrical conductivity. A report on this investigation is being prepared for publication. Studies on the effect of gamma radiation upon the physical properties of anthracite [4] were also concluded with research on the reactions with chlorine, following those with flourine. In the presence of radiation at 400° C., the volatile matter in the residue increased 350 percent compared to 270 percent without radiation.

The possibility of converting anthracite by chemical treatment into a form suitable for use in carbon products requiring ultrafine particles was also studied with concentrated nitric acid as the oxidizing agent. Further work is planned to study the effect of alkali concentration on the dispersion of the acid-insoluble residue and the nature of the residue dispersed with 0.1 normal sodium hydroxide.

**Utilization.**—Bureau studies to promote the use of anthracite as a metallurgical fuel [5] were extended during the year to investigate the possible use of calcined hollow-core briquets as a blast furnace fuel. If successful, the fuel will be tested in the Bureau's experimental blast furnace at Bruceton, Pa. The initial objective was to develop the forming and calcining process to produce briquets with a tumbler stability approximating the 45 percent obtained in previous pilot plant production. Experiments were conducted with a screw feed compactor on the feed system, and the product compared with briquets made with a paddle-feeder installation. The briquets made with the compactor showed an increase of 30 percent in tumbler stability, using both direct and indirect firing. A series of experiments were made to determine the feasibility of crushing and reprocessing approximately 175 tons of inferior quality raw briquets, with an addition to the coal-tar pitch content. The results indicated an average tumbler stability increase from 44.8 to 52.4 percent by adding 1 percent coal-tar pitch. The use of steam injection to improve heating and mixing was attempted, but failed to show any improvement in the quality of the finished briquets. The process was improved by increasing the operating temperatures of the pug mill. The operating temperature was increased about 30° F. by installing a separate steam line operating at 195 psi and cooling the mix to about 170° F. before pressing. The briquets consisted of 8 percent coal tar pitch, 10 percent bituminous coal, and 82 percent anthracite. Forming pressure was 3,000 psi; soaking period was 90 minutes at 1,750° F. Test runs were made with buckwheat No. 5 as received, buckwheat No. 5 crushed to minus ½₂ inch, and buckwheat No. 6. A substantial increase in briquet strength was noted when the buckwheat No. 5 was crushed. However, only a small increase was noted

[4] Husack, Ralph, G. A. Brady, and J. W. Eckerd. Effect of Gamma Radiation on Anthracite. BuMines Rept. of Inv. 6391, 1964, 28 pp.

[5] Eckerd, J. W., R. E. McKeever, W. S. Sanner, and P. L. Woolf. Anthracite Metallurgical Briquets as Blast Furnace Fuel. BuMines Rept. of Inv. 6383, 1964, 16 pp.

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over the stability of briquets made with buckwheat No. 6, indicating that a separate crushing operation would not be warranted in a plant setup. Improvements in processing techniques during the experimental runs achieved an ASTM tumbler stability of 56 percent for reprocessed briquets and 59.5 percent for new briquets. Processing variations will be studied to improve manufacturing techniques.

Pressure-drop studies were concluded in the simulated metallurgical blast furnace. Ten tests were run on shaft packings of pellets and sinter (furnished by a cooperating steel company) with furnace coke or anthracite briquets, ore pellets without fuel, and calcined anthracite briquets. The slopes of the basic trends for the burdens tested are being studied as a function of the permeability characteristics.

The basic trend of a pellet-pillow briquet burden in standard layers was found to be nearly parallel to the trend of the same burden with the components mixed. The average pressure drops of the mixed burden were 24 percent higher than the layered burden at 3 feet per second, and 19 percent higher at 10 feet per second. The use of pillow briquets instead of coke in layered sinter burdens increased the average pressure drop per foot of bed depth by 44 to 48 percent.

The basic pressure-drop trends, with increasing superficial air velocity, of hollow-core, pillow-, and bolster-shaped briquets were nearly parallel, but showed substantial differences in pressure drops. The pressure drops with pillow briquets were from 10 to 13 percent higher than those of the hollow-core briquets at velocities of 4 through 13 feet per second. The bolster briquets had pressure drops from 18 to 21 percent lower than the hollow-core briquets through the same range of air velocities. A summary of each run and an evaluation of results are being prepared.

The Bureau's experimental program on hydrogasification of anthracite was continued with the design and construction of a miniscale hydrogasification plant. A plastic-fluidization reactor was also constructed to investigate the fluidizing characteristics associated with the proposed process. The plant was pressure-tested in several runs, first with nitrogen, then with hydrogen at temperatures from 800° F. to 1,000° F., and pressures from 300 to 800 psi. Procedures were devised for the analysis of the gases produced. Experiments completed to date to form methane indicate that very little reaction between anthracite and hydrogen occurs at 800° F. Tests are planned for 1,000° F. at 300 psi.

**Acid Mine Water.**—The study of acid mine water was conducted in three phases: (1) an investigation of the mechanics of water-contaminant formation to obtain a better understanding of the mechanical and physical processes involved in the production of acid mine water; (2) analyses of mine water samples to identify significant properties, and (3), investigations to develop methods of treating mine water to abate stream contamination. Analytical procedures were established for determining the chief constituents in mine water, except for sodium and potassium. Tests with sulfuric mine refuse and crystalline pyrite indicated that the sulfuric refuse produces acid at twice the rate of the pyrite. The effect of temperature and water on acid production was also studied. A significant reduction in the total acidity, total iron, and manganese was accomplished in samples run by demineralization achieved by exchanging the cations and anions in the water for hydrogen and hydroxide ions,

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respectively, in the resin. Visible water discharges from abandoned mines throughout the region were estimated.

**Mine Water Control.**—The mine water and surface subsidence control program authorized by Public Law 162, Act of July 15, 1955, was amended October 15, 1962 (Public Law 87–818) to extend the original authority to permit sealing and filling openings in abandoned anthracite mines in the interest of public health and safety. Projects completed in cooperation with the Commonwealth of Pennsylvania to protect active mines and anthracite reserves from inundation included the construction of a surface-drainage system in the Southern field and the installation of a deep-well pumping station in an abandoned underground mine in the Northern field. Also, work was started on three mine-void backfilling Public Health and Safety projects in the Northern field. These projects are designed to protect the inhabitants and surface structures in heavily populated parts of Scranton, Wilkes-Barre, and Plymouth from the hazards of subsidence. The combined project areas total 106 acres and include over 600 dwellings and business establishments, 4 churches, and 4 schools—with an estimated total value of $12.3 million. The total contract cost of the three projects is $1,800,000 (of which the Federal Government will pay one-half), including the purchase of two mine-refuse crushing and screening plants to prepare backfill material. Both plants are mobile and will be used on further projects of this type. The use of the waste-piles, which were donated by private owners to the local municipalities, not only eliminates them as unsightly fire hazards but makes the sites available for more useful purposes.

**Microfilming.**—The program, initiated in 1962 by the Bureau to place on film all available data relating to abandoned anthracite mines, showed satisfactory progress during the year. Maps, cross-sections, and other relevant data relating to over 100 mines were recorded. The work involved about 2,900 maps and 7,600 photographic frames, including those of the map folios compiled in conjunction with the Bureau's study undertaken for the U.S. Army Corps of Engineers. The value of the program was evidenced when the microfilmed records were used to furnish copies of a group of mine maps that were destroyed by fire after having been microfilmed and to obtain subsurface data requested by two communities interested in determining surface stability in selected areas. A Bureau Information Circular is being prepared for publication on the first phase of the microfilming program.

**Other Research Activities.**—Supported by the Pennsylvania Coal Research Board, the Mineral Industries Experiment Station, College of Mineral Industries, the Pennsylvania State University continued research into the properties of anthracite, [6] [7] combustion processes [8] and on developing new uses [9] in an effort to expand markets and promote the economic well-being of the industry. Studies are also being conducted of acid mine drainage, mining costs, and treatment of refuse piles.

[6] Walker, Philip L., and Satyendra Prosad Nandi. The Unsteady State Diffusion of Gases from Coals. Coal Res. Board of the Commonwealth of Pennsylvania, Special Res. Rept. 42, February 1964, 137 pp.

[7] Campbell, John A. L., and S. C. Sun. The Electrokinetic Behavior of Anthracite Coals and Lithotypes. Coal Res. Board of the Commonwealth of Pennsylvania, Special Res. Rept. 44, May 1964, 139 pp.

[8] Marshall, W. F., Jr., and H. B. Palmer. The Effect of Concentration and Particle Size on the Burning Velocity of Laminar Coal Dust Flames. Coal Res. Board of the Commonwealth of Pennsylvania, Special Res. Rept. 43, March 1964, 54 pp.

[9] Utley, Ronald W., H. L. Lovell and T. S. Spicer. The Utilization of Coal Refuse for the Manufacture of Lightweight Aggregate. Coal Res. Board of the Commonwealth of Pennsylvania, Special Res. Rept. 46, September 1964, 98 pp.

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# Coke and Coal Chemicals

By J. A. DeCarlo [1] and E. T. Sheridan [2]

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## GENERAL SUMMARY

THE COKE industry kept pace with the general upswing in industrial activity in 1964, and total coke output increased 14 percent. Both oven and beehive plants operated at increased rates throughout most of the year. Production was greater in the second half of the year, particularly in the last quarter; output for December reached 5.7 million tons, the highest monthly production since April 1960. During the year, the monthly production index (1957–59=100) of oven-coke plants, which produced 98 percent of the total coke, rose 20.7 points—from 89.6 in December 1963 to 110.3 in December 1964. In the first 6 months, the index averaged 95.9, compared with an average of 105.2 recorded during the second half, and an overall average of 100.6 for the entire year. Furnace plants registered a 14-percent increase in production for the year, and merchant plants a 13-percent increase. The index, however, was influenced by the out-

[1] Supervisory chemical engineer.
[2] Mineral specialist.



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put of the furnace plants, which produced 90 percent of the total coke. The beehive segment of the industry was particularly active, and annual production reached 1.2 million tons, the highest output of beehive coke since 1957. As with oven-coke production, beehive output was highest in the last quarter of the year, with production in December nearly double that of December 1963. There was no construction of new ovens, and the increased output was accomplished by the reactivation of ovens that had been idle for several years.

Demand for coke was high, and apparent consumption was about one-half million tons greater than production. In addition, exports exceeded imports by 420,000 tons, resulting in a net decrease of nearly 1 million tons in producers' stocks. On hand at the end of December was 2 million tons of oven and beehive coke, equivalent to 10.7 days' production at the December rate of operation.

Ninety-one percent of the coke distributed in the United States was shipped to blast furnaces. Although blast-furnace shipments increased 15 percent, and were nearly 7.5 million tons greater than in 1963, blast-furnace fuel rates continued to decline, and less coke was required to produce each ton of pig iron and ferroalloys. According to data published by the American Iron and Steel Institute, the average annual coke rate of all blast furnaces operating in 1964 was only 1,323.6 pounds, compared with 1,350.5 pounds in 1963, and 1,634.4 pounds in 1957–59. Although the decline in 1964 represented a saving of 26.9 pounds of coke for each ton of pig iron and ferroalloys produced, this decrease was substantially less than the annual decreases registered in the past 5 years because a number of idle blast furnaces, not equipped with fuel injection systems, pressure tops, and other coke-saving devices, were pressed into service to meet the rising demand for pig iron and ferroalloys.

The remaining 9 percent of the coke distributed by producers in the United States was sold principally to foundries and miscellaneous industrial plants as industrial fuel. A small quantity was sold also for residential heating, but this market has been declining steadily, and is expected soon to be nonexistent. Shipments to foundries and to other industrial plants increased 11 percent and 16 percent, respectively. Both categories were influenced by the large demand for industrial materials in 1964, particularly castings, nonferrous metals, and industrial chemicals.

Production of breeze or coke screenings increased 8 percent. This was substantially less than the 14-percent gain in coke production because of lower breeze yields, particularly at beehive plants where the yield was about one-half that recorded in 1963. Unsuitable for most metallurgical applications because of its size and ash content, breeze is used by producers for sintering iron ores and for steam raising. About one-fourth of the production in 1964 was sold, mainly for use as a reductant in electric furnaces that smelt phosphate rock to produce elemental phosphorus. Sales of breeze were 13 percent higher than in 1963.

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The delivered cost of coal to oven-coke plants continued to decline, and the average value of all coals carbonized at oven-coke plants was $0.21 per ton less than in 1963. The decrease was attributed to lower freight rates and a $0.01 per ton decrease in the average f.o.b. plant value of all bituminous coal produced. The average value per short ton of coal carbonized at oven-coke plants in 1964 ranged from $7.66 at plants in West Virginia to $12.59 at plants in California, Colorado, and Utah.

Production of all basic coal-chemical materials increased in 1964, with tar, light oil, ammonia, and coke-oven gas showing increases ranging between 10 and 14 percent over that of 1963. All increases were attributed to the larger quantity of coal carbonized, as the yield of all products declined because of higher operating rates, with the exception of light oil which remained at about the same level. The increased ammonia supply resulted in production increases of 10 percent for ammonium sulfate, 11 percent for ammonia liquor, and 19 percent for diammonium and monoammonium phosphate. Although production of crude tar and light oil were substantially higher than in 1963, output of some tar and light-oil derivatives did not increase proportionately because a few plants discontinued their processing operations. This was due to a number of economic factors, and to the inability of some plants to produce light-oil derivatives of high purity.

Prices of coke-oven products were firm throughout the year. According to trade journals, except for a $1.50-per-ton increase in the f.o.b. price of oven-foundry coke in several areas, prices of oven-foundry, beehive-furnace, and beehive-foundry coke remained at the 1963 level. Prices in 1964, f.o.b. plant, ranged from $14.75 to $15.25 in Pennsylvania to $16.25 in Virginia for beehive-furnace coke; $18.00 to $18.50 in Pennsylvania for beehive-foundry coke; and $31 at Swedeland, Pa., to $34.50 at St. Louis, Mo., for over-foundry coke. The prices of coal chemicals remained the same, except ammonium sulfate, which increased from $30 to $32 to $34 per ton during the year.

Foreign trade in coke was relatively small, with exports of 524,000 tons and imports of about 100,000 tons. Canada was the principal market for both exports and imports.

Foreign trade in basic coal chemicals was insignificant also, except for exports of coal-tar pitch, which increased nearly 2.5 times, and totaled 222,000 tons. Approximately two-thirds of this quantity was shipped to France for use as a binder for coal briqueting. Only a part of the pitch exports, however, was produced at coke plants, as tar-refining plants also exported some pitch.

The total value of all coals carbonized was $820 million, and the total value of all carbonization products used and sold was $1,420 million. The latter value was 73 percent more than the value of the coals, while the value of coke and breeze, the principal products, represented 80 percent of the value of products recovered.

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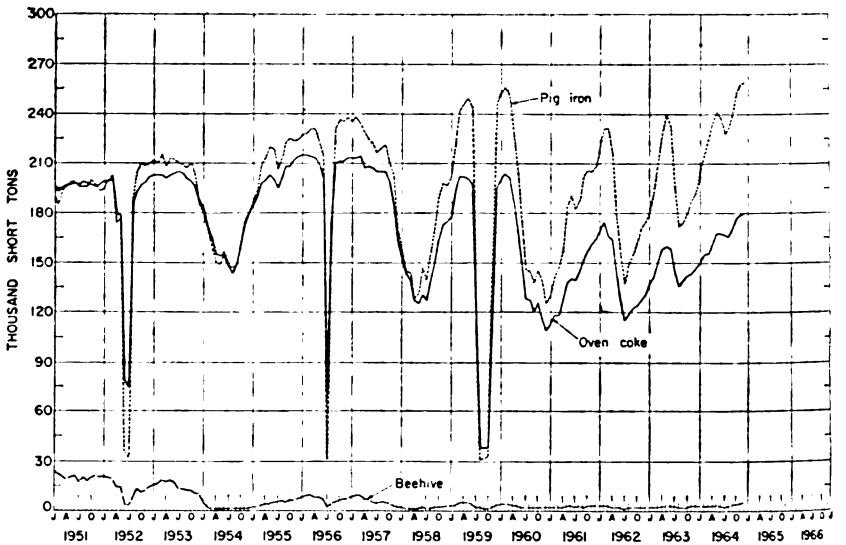


FIGURE 1.—Average daily production of oven and beehive coke and pig iron in the United States, by month.

**TABLE 1.—Salient coke statistics**

| | 1957–59 (average) | 1962 | 1963 | 1964 |
|---|---|---|---|---|
| **United States:** | | | | |
| Production: | | | | |
| Oven coke ..... short tons | 60,551,900 | 51,098,420 | 53,307,609 | 60,906,391 |
| Beehive coke ..... do | 1,254,232 | 811,872 | 970,698 | 1,236,287 |
| Total ..... do | 61,806,132 | 51,910,292 | 54,278,307 | 62,144,678 |
| Imports ..... do | 120,908 | 141,883 | 152,595 | 103,286 |
| Exports ..... do | 558,428 | 364,032 | 451,241 | 523,695 |
| Producers' stocks, Dec. 31 ..... do | [1] 4,682,436 | 3,906,811 | 2,884,931 | 1,971,892 |
| Consumption, apparent ..... do | 60,585,947 | 51,823,205 | 55,001,541 | 62,637,308 |
| Ovens: | | | | |
| Slot in existence, Dec. 31 ..... | [1] 15,993 | 14,561 | 14,586 | 14,639 |
| Beehive in existence, Dec. 31 ..... | [1] 7,448 | 4,979 | 4,907 | 5,071 |
| Value of coal-chemical materials used or sold ..... | $330,902,284 | $264,739,789 | $254,220,290 | $290,952,399 |
| Value of coke and breeze produced ..... | 1,143,589,918 | 963,211,681 | 977,060,009 | 1,128,925,328 |
| Total value of all products ..... | 1,474,492,202 | 1,227,951,470 | 1,231,280,299 | 1,419,877,727 |
| **World production:** | | | | |
| Hard coke ..... thousand short tons | 287,855 | r 301,012 | r 307,795 | 326,602 |
| Gashouse and low-temperature coke ..... do | 51,130 | r 50,310 | r 49,960 | 48,630 |

r Revised.
[1] 1959.

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**TABLE 2.—Statistical summary of the coke industry in the United States in 1964**

| | Slot ovens | Beehive ovens | Total |
|---|---|---|---|
| Coke produced: | | | |
| At merchant plants: | | | |
| Short tons | 6,335,528 | (1) | (1) |
| Value | $139,299,997 | (1) | (1) |
| At furnace plants: [2] | | | |
| Short tons | 54,572,863 | (1) | (1) |
| Value | $944,576,184 | (1) | (1) |
| Total: | | | |
| Short tons | 60,908,391 | 1,236,287 | 62,144,678 |
| Value | $1,083,876,181 | $18,592,081 | $1,102,468,262 |
| Breeze produced: | | | |
| Short tons | 3,902,047 | 22,383 | 3,924,430 |
| Value | $26,411,679 | $44,956 | $26,456,635 |
| Coal carbonized: | | | |
| Bituminous: | | | |
| Short tons | 86,732,161 | 2,025,415 | 88,757,576 |
| Value | $804,155,920 | $10,766,852 | $814,922,772 |
| Average per ton | $9.27 | $5.32 | $9.18 |
| Anthracite: | | | |
| Short tons | 492,318 | ---- | 492,318 |
| Value | $5,266,953 | ---- | $5,266,953 |
| Average per ton | $10.70 | ---- | $10.70 |
| Total: | | | |
| Short tons | 87,224,479 | 2,025,415 | 89,249,894 |
| Value | $809,422,873 | $10,766,852 | $820,189,725 |
| Average per ton | $9.28 | $5.32 | $9.19 |
| Average yield in percent of total coal carbonized: | | | |
| Coke | 69.83 | 61.04 | 69.63 |
| Breeze (at plants actually recovering) | 4.47 | 3.84 | 4.47 |
| Coke used by producing companies: | | | |
| In blast furnaces: | | | |
| Short tons | 52,840,688 | (3) | 52,840,688 |
| Value | $914,103,967 | (3) | $914,103,967 |
| In foundries: | | | |
| Short tons | 334,163 | ---- | 334,163 |
| Value | $10,485,581 | ---- | $10,485,581 |
| For other industrial uses: [4] | | | |
| Short tons | 676,815 | ---- | 676,815 |
| Value | $12,042,455 | ---- | $12,042,455 |
| Breeze used by producing companies: | | | |
| In steam plants: | | | |
| Short tons | 632,391 | ---- | 632,391 |
| Value | $3,956,378 | ---- | $3,956,378 |
| In agglomerating plants: | | | |
| Short tons | 1,763,660 | ---- | 1,763,660 |
| Value | $11,562,902 | ---- | $11,562,902 |
| For other industrial uses: | | | |
| Short tons | 434,015 | ---- | 434,015 |
| Value | $2,629,429 | ---- | $2,629,429 |
| Coke sold (commercial sales): | | | |
| To blast furnaces: | | | |
| Short tons | 3,459,794 | 698,734 | 4,158,528 |
| Value | $53,780,793 | $10,168,092 | $63,948,885 |
| Average per ton | $15.54 | $14.55 | $15.38 |
| To foundries: | | | |
| Short tons | 2,697,531 | 43,639 | 2,741,170 |
| Value | $82,084,643 | $765,228 | $82,849,871 |
| Average per ton | $30.43 | $17.54 | $30.22 |
| To other industrial plants: [5] | | | |
| Short tons | 1,456,528 | 486,122 | 1,942,650 |
| Value | $23,004,280 | $7,620,856 | $30,625,136 |
| Average per ton | $15.79 | $15.68 | $15.76 |
| For residential heating: | | | |
| Short tons | 239,812 | 11,139 | 250,951 |
| Value | $3,905,145 | $87,260 | $3,992,405 |
| Average per ton | $16.28 | $7.83 | $15.91 |
| Breeze sold (commercial sales): | | | |
| Short tons | 1,093,052 | 22,638 | 1,115,690 |
| Value | $8,259,236 | $45,387 | $8,304,623 |
| Average per ton | $7.56 | $2.00 | $7.44 |

**See footnotes at end of table.**

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**TABLE 2.—Statistical summary of the coke industry in the United States in 1964—Continued**

| | Slot ovens | Beehive ovens | Total |
|---|---|---|---|
| Coal-chemical materials produced: | | | |
| Crude tar: | | | |
| Gallons | 762,917,505 | | 762,917,505 |
| Gallons per ton of coal | 8.75 | | 8.75 |
| Ammonia: [6] | | | |
| Short tons | 793,908 | | 793,908 |
| Pounds per ton of coal | 18.49 | | 18.49 |
| Crude light oil: | | | |
| Gallons | 248,668,967 | | 248,668,967 |
| Gallons per ton of coal | 2.92 | | 2.92 |
| Gas: | | | |
| Thousand cubic feet | 904,697,479 | | 904,697,479 |
| Thousand cubic feet per ton of coal | 10.37 | | 10.37 |
| Percent burned in coking process | 34.73 | | 34.73 |
| Percent surplus used or sold | 64.35 | | 64.35 |
| Percent wasted | .92 | | .92 |
| Value of coal-chemical materials used or sold: | | | |
| Crude tar and derivatives: | | | |
| Used | $33,231,123 | | $33,231,123 |
| Sold | $61,468,029 | | $61,468,029 |
| Ammonia products [7] | $23,982,158 | | $23,982,158 |
| Crude light oil and derivatives [8] | $40,003,625 | | $40,003,625 |
| Surplus gas | $132,267,464 | | $132,267,464 |

[1] Not separately recorded.
[2] Plants associated with iron-blast furnaces (refer to definition in "Scope of Report").
[3] Included with "Sales" to avoid disclosing individual company data.
[4] Includes coke for producer- and water-gas manufacture.
[5] Includes coke sold to water-gas plants.
[6] In terms of sulfate equivalent.
[7] Includes ammonium sulfate, ammonia liquor ($NH_3$ content), and diammonium and monoammonium phosphate.
[8] Includes intermediate light oil.

**TABLE 3.—Summary of oven-coke operations in the United States in 1964, by State**

| State | In existence Dec. 31 [1] | | Coal carbonized (short tons) | Yield of coke from coal (percent) | Coke produced (short tons) | Value of coke at ovens | |
|---|---|---|---|---|---|---|---|
| | Plants | Ovens | | | | Total | Per ton |
| Alabama | 7 | 1,516 | 6,365,139 | 73.67 | 4,689,108 | $85,549,979 | $18.24 |
| California, Colorado, Utah | 3 | 773 | 4,687,274 | 62.64 | 2,935,921 | 65,314,900 | 22.25 |
| Connecticut, Maryland, New Jersey, New York | 6 | 1,802 | 11,043,820 | 69.61 | 7,687,284 | 126,783,218 | 16.49 |
| Illinois | 6 | 568 | 3,366,792 | 68.27 | 2,298,576 | 43,382,598 | 18.87 |
| Indiana | 5 | 2,218 | 11,742,407 | 69.58 | 8,170,323 | 156,463,275 | 19.15 |
| Kentucky, Missouri, Tennessee, Texas | 5 | 438 | 2,897,135 | 71.07 | 2,058,916 | 37,178,811 | 18.06 |
| Michigan | 4 | 778 | 5,305,865 | 73.65 | 3,907,944 | 66,885,423 | 17.12 |
| Minnesota and Wisconsin | 3 | 380 | 1,205,977 | 77.35 | 932,804 | 18,419,554 | 19.75 |
| Ohio | 12 | 1,836 | 10,352,914 | 69.97 | 7,243,587 | 128,850,524 | 17.79 |
| Pennsylvania | 12 | 3,662 | 25,313,522 | 69.51 | 17,594,174 | 299,388,148 | 17.02 |
| West Virginia | 3 | 668 | 4,943,634 | 68.57 | 3,389,754 | 55,659,751 | 16.42 |
| Total 1964 | 66 | 14,639 | 87,224,479 | 69.83 | 60,908,391 | 1,063,876,181 | 17.80 |
| At merchant plants | 17 | 1,894 | 8,822,552 | 71.81 | 6,335,528 | 139,299,997 | 21.99 |
| At furnace plants | 49 | 12,745 | 78,401,927 | 69.61 | 54,572,863 | 944,576,184 | 17.31 |
| Total 1963 | 66 | 14,586 | 76,470,038 | 69.71 | 53,307,609 | 936,962,187 | 17.58 |

[1] Excludes plants retired permanently during year.

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**TABLE 4.—Summary of beehive-coke operations in the United States in 1964, by State**

| State | In existence Dec. 31 [1] | | Coal carbonized (short tons) | Yield of coke from coal (percent) | Coke produced (short tons) | Value of coke at ovens | |
|---|---|---|---|---|---|---|---|
| | Plants | Ovens | | | | Total | Per ton |
| Pennsylvania | 18 | 3,800 | 914,405 | 61.44 | 561,777 | $7,571,657 | $13.48 |
| Kentucky, Virginia, West Virginia | 8 | 1,271 | 1,111,010 | 60.71 | 674,510 | 11,020,424 | 16.34 |
| Total: | | | | | | | |
| 1964 | 26 | 5,071 | 2,025,415 | 61.04 | 1,236,287 | 18,592,081 | 15.04 |
| 1963 | 26 | 4,907 | 1,612,581 | 60.20 | 970,698 | 14,929,656 | 15.38 |

[1] Excludes plants retired permanently during year.

## SCOPE OF REPORT

This chapter covers high-temperature oven and beehive coke and related products. All data, except where noted, were supplied by coke-producing companies in the United States. Only products made in high-temperature slot and beehive ovens were included; products made by other carbonization processes (coal-gas retorts, low-temperature coal carbonization, and carbonization of residues from the refining of coal tar and petroleum) were specifically excluded. Approximately 16.8 million tons of petroleum coke was produced in 1964.

In addition to coke produced in high-temperature slot and beehive ovens, six companies produced 200,000 tons of coke and char in unconventional carbonizing units. One manufactured a low-temperature coke known as Disco by a continuous process. Another producer carbonized lignite in a Lurgi gasifier and manufactured briquets from the char. Three plants produced high-temperature coke with traveling-grate stokers. One plant produced high-temperature chemical coke in an experimental rotary-hearth carbonizer.

Of the 66 oven-coke plants surveyed by the Bureau of Mines in 1964, 63 were active all year, 2 were idle all year, and 1 was active part of the year, but later was closed permanently. Of the 27 beehive plants surveyed, only 11 operated the entire year, 8 were active part of the year, and the remainder were idle.

The terms "merchant" and "furnace" in this chapter apply only to oven-coke plants. Furnace plants are owned by, or are financially affiliated with, iron and steel companies that produce coke mainly for use in their blast furnaces. Merchant plants include those that manufacture metallurgical, industrial, and residential-heating grades of coke for sale on the open market; those associated with chemical companies or gas utilities; and those affiliated with local iron works that consume only a small part of their output in affiliated blast furnaces.

The term "coke" in this chapter refers only to the large sizes (usually plus one-half inch) from which the smaller sizes, called breeze, have been screened. "Metallurgical coke" refers to grades used for smelting and casting ferrous metals in blast furnaces and foundries.

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## OVEN AND BEEHIVE COKE AND BREEZE

### MONTHLY AND AVERAGE DAILY PRODUCTION

Coke is used primarily as fuel for industrial applications, and production is governed mainly by industrial activity rather than by seasonal variations. The steady rise in industrial activity in the latter part of 1964 induced corresponding increases in coke production; for example, the average daily production of oven coke in December was the highest since April 1960, and beehive production in December was nearly double the average daily output in January.

Table 5 summarizes monthly and average daily production of oven and beehive coke in 1964 and shows comparable data for two preceding years and for the 1957–59 bench-mark period.

Preliminary data on average daily and monthly production are published regularly by the Bureau of Mines in Mineral Industry Survey, Coke and Coal Chemicals, Monthly. This publication may be obtained free of charge by writing to the Bureau of Mines Publications Distribution Section, 4800 Forbes Ave., Pittsburgh, Pa., 15213.

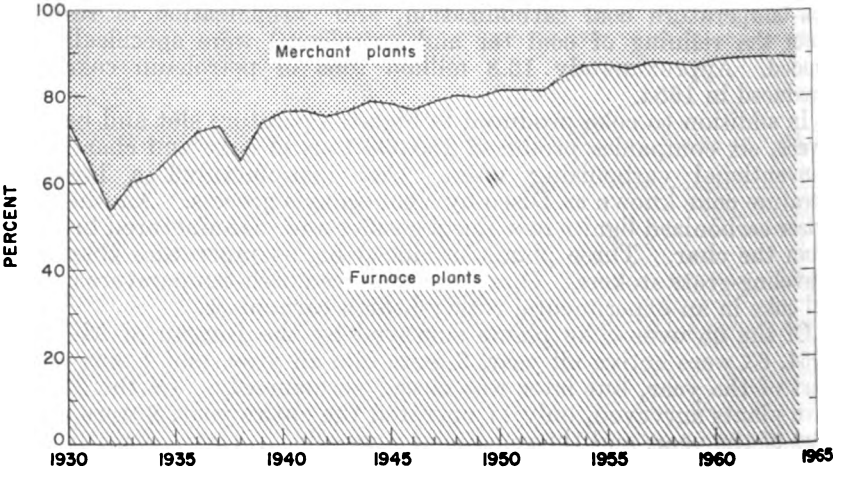


FIGURE 2.—Production of oven coke in the United States, by type of plant.

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**TABLE 5.—Production of oven and beehive coke in the United States, by month[1]**

(Short tons)

| Month | 1957–59 (average) | | 1962 | | 1963 | | 1964 | |
|---|---|---|---|---|---|---|---|---|
| | Total | Daily average | Total | Daily average | Total | Daily average | Total | Daily average |
| Oven coke: | | | | | | | | |
| January | 5,630,000 | 181,600 | 5,273,400 | 170,100 | 4,244,600 | 136,900 | 4,660,100 | 150,300 |
| February | 5,159,400 | 184,300 | 4,866,900 | 173,800 | 3,953,800 | 141,200 | 4,485,000 | 154,700 |
| March | 5,744,700 | 185,300 | 5,154,100 | 166,300 | 4,627,500 | 149,300 | 4,820,300 | 155,500 |
| April | 5,378,300 | 179,300 | 4,926,300 | 164,200 | 4,740,300 | 158,000 | 4,853,900 | 161,800 |
| May | 5,532,400 | 178,500 | 4,451,800 | 143,600 | 4,963,400 | 160,100 | 5,191,500 | 167,500 |
| June | 5,352,800 | 178,400 | 3,786,800 | 126,200 | 4,734,100 | 157,800 | 5,036,500 | 167,900 |
| July | 4,603,300 | 148,500 | 3,550,400 | 114,500 | 4,466,500 | 144,100 | 5,163,400 | 166,500 |
| August | 4,151,700 | 133,900 | 3,690,900 | 119,100 | 4,200,400 | 135,500 | 5,138,200 | 165,800 |
| September | 4,121,500 | 137,400 | 3,691,300 | 123,100 | 4,157,200 | 138,600 | 5,141,000 | 171,300 |
| October | 4,340,000 | 140,000 | 3,850,900 | 124,200 | 4,390,600 | 141,600 | 5,476,100 | 176,600 |
| November | 5,002,600 | 166,800 | 3,822,600 | 127,400 | 4,289,000 | 143,000 | 5,373,300 | 179,100 |
| December | 5,535,200 | 178,500 | 4,033,000 | 130,100 | 4,540,200 | 146,500 | 5,569,100 | 179,600 |
| Total | 60,551,900 | 165,900 | 51,098,400 | 140,000 | 53,307,600 | 146,000 | 60,908,400 | 166,400 |
| Beehive coke: | | | | | | | | |
| January | 132,200 | 4,300 | 102,200 | 3,300 | 66,400 | 2,200 | 86,100 | 2,800 |
| February | 127,900 | 4,500 | 93,900 | 3,400 | 67,100 | 2,400 | 82,100 | 2,800 |
| March | 150,300 | 4,900 | 97,600 | 3,100 | 66,900 | 2,100 | 93,100 | 3,000 |
| April | 138,900 | 4,600 | 70,400 | 2,400 | 87,600 | 2,900 | 92,500 | 3,100 |
| May | 118,700 | 3,800 | 59,000 | 1,900 | 102,000 | 3,300 | 93,900 | 3,000 |
| June | 107,900 | 3,600 | 54,100 | 1,800 | 96,200 | 3,200 | 81,400 | 2,700 |
| July | 80,000 | 2,600 | 43,800 | 1,400 | 84,200 | 2,700 | 69,800 | 2,300 |
| August | 82,600 | 2,700 | 50,400 | 1,600 | 79,500 | 2,600 | 94,300 | 3,000 |
| September | 78,600 | 2,600 | 51,900 | 1,700 | 79,000 | 2,600 | 113,200 | 3,800 |
| October | 75,300 | 2,400 | 63,900 | 2,100 | 82,600 | 2,700 | 126,800 | 4,100 |
| November | 76,100 | 2,500 | 65,900 | 2,200 | 77,600 | 2,600 | 142,300 | 4,800 |
| December | 85,700 | 2,800 | 58,800 | 1,900 | 81,600 | 2,600 | 160,800 | 5,200 |
| Total | 1,254,200 | 3,400 | 811,900 | 2,200 | 970,700 | 2,700 | 1,236,300 | 3,400 |
| Total: | | | | | | | | |
| January | 5,762,200 | 185,900 | 5,375,600 | 173,400 | 4,311,000 | 139,100 | 4,746,200 | 153,100 |
| February | 5,287,300 | 188,800 | 4,960,800 | 177,200 | 4,020,900 | 143,600 | 4,567,100 | 157,500 |
| March | 5,895,000 | 190,200 | 5,251,700 | 169,400 | 4,694,400 | 151,400 | 4,913,400 | 158,500 |
| April | 5,517,200 | 183,900 | 4,996,700 | 166,600 | 4,827,900 | 160,900 | 4,946,400 | 164,900 |
| May | 5,651,100 | 182,300 | 4,510,800 | 145,500 | 5,065,400 | 163,400 | 5,285,400 | 170,500 |
| June | 5,460,700 | 182,000 | 3,840,900 | 128,000 | 4,830,300 | 161,000 | 5,117,900 | 170,600 |
| July | 4,683,300 | 151,100 | 3,594,200 | 115,900 | 4,550,700 | 146,800 | 5,233,200 | 168,800 |
| August | 4,234,300 | 136,600 | 3,741,300 | 120,700 | 4,279,900 | 138,100 | 5,232,500 | 168,800 |
| September | 4,200,100 | 140,000 | 3,743,200 | 124,800 | 4,236,200 | 141,200 | 5,254,200 | 175,100 |
| October | 4,415,300 | 142,400 | 3,914,800 | 126,300 | 4,473,200 | 144,300 | 5,602,900 | 180,700 |
| November | 5,078,700 | 169,300 | 3,888,500 | 129,600 | 4,366,600 | 145,600 | 5,515,600 | 183,900 |
| December | 5,620,900 | 181,300 | 4,091,800 | 132,000 | 4,621,800 | 149,100 | 5,729,900 | 184,800 |
| Total | 61,806,100 | 169,300 | 51,910,300 | 142,200 | 54,278,300 | 148,700 | 62,144,700 | 169,800 |

[1] Daily average calculated by dividing monthly production by number of days in month.



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## PRODUCTION BY MERCHANT AND FURNACE PLANTS

The classification of oven-coke plants according to type of ownership (merchant or furnace plants) was initiated in 1920 and is maintained by the Bureau of Mines to delineate trends in production for each segment of the industry.

As shown in figure 2, a tremendous change in the pattern of production has occurred since the early 1930's when merchant operators produced about one-fourth of the total coke output, as opposed to only 10 percent in 1964. Drastic reductions in the use of coke for residential heating and gas manufacture, markets formerly supplied largely by merchant plants, resulted in the steady decline in production from these plants. Contributing also to the decline in merchant output was the expansion program in coking capacity, started by the steel companies during the World War II era, to meet their own normal blast-furnace coke needs. Previously, most of the iron-producing companies built oven-coke capacity sufficient for only about 80 percent of normal requisites and, in periods of heavy demand, additional blast-furnace coke requirements were obtained from merchant oven- and beehive-coke plants. Although blast-furnace coke consumption in 1964 was the highest since 1957, only 6 percent was obtained from merchant oven- and beehive-coke plants.

Production of oven coke by merchant and furnace plants in 1964 is shown in tables 6 and 7.

**TABLE 6.—Production of oven coke in the United States, by type of plant**

(Short tons)

| Month | 1957-59 (average) | | 1962 | | 1963 | | 1964 | |
|---|---|---|---|---|---|---|---|---|
| | Merchant plants | Furnace plants | Merchant plants | Furnace plants | Merchant plants | Furnace plants | Merchant plants | Furnace plants |
| Production: | | | | | | | | |
| January | 705,700 | 4,924,300 | 512,600 | 4,760,800 | 488,400 | 3,756,200 | 515,000 | 4,145,100 |
| February | 641,100 | 4,518,300 | 490,300 | 4,376,600 | 455,700 | 3,498,100 | 507,000 | 3,978,000 |
| March | 681,400 | 5,063,300 | 523,500 | 4,630,600 | 497,900 | 4,129,600 | 541,200 | 4,279,100 |
| April | 612,900 | 4,765,400 | 485,200 | 4,441,100 | 483,100 | 4,257,200 | 528,300 | 4,325,600 |
| May | 609,800 | 4,922,600 | 454,400 | 3,997,400 | 478,400 | 4,485,000 | 544,100 | 4,647,400 |
| June | 575,800 | 4,777,000 | 405,700 | 3,381,100 | 468,500 | 4,265,600 | 520,700 | 4,515,800 |
| July | 569,100 | 4,034,200 | 378,000 | 3,172,400 | 436,800 | 4,029,700 | 524,500 | 4,638,900 |
| August | 573,200 | 3,578,500 | 415,100 | 3,275,800 | 451,300 | 3,749,100 | 494,900 | 4,643,300 |
| September | 572,900 | 3,548,600 | 412,200 | 3,279,100 | 435,600 | 3,721,600 | 514,600 | 4,626,400 |
| October | 586,000 | 3,754,000 | 433,600 | 3,417,300 | 475,600 | 3,915,000 | 532,600 | 4,943,500 |
| November | 582,700 | 4,419,900 | 444,300 | 3,378,300 | 452,600 | 3,836,400 | 546,000 | 4,827,300 |
| December | 649,000 | 4,886,200 | 483,500 | 3,549,500 | 502,800 | 4,037,400 | 566,600 | 5,002,800 |
| Total | 7,359,600 | 53,192,300 | 5,438,400 | 45,660,000 | 5,626,700 | 47,680,900 | 6,335,500 | 54,572,900 |
| Daily average: | | | | | | | | |
| January | 22,800 | 158,800 | 16,500 | 153,600 | 15,700 | 121,200 | 16,600 | 133,700 |
| February | 22,900 | 161,400 | 17,500 | 156,300 | 16,300 | 124,900 | 17,500 | 137,200 |
| March | 22,000 | 163,300 | 16,900 | 149,400 | 16,100 | 133,200 | 17,500 | 138,000 |
| April | 20,400 | 158,900 | 16,200 | 148,000 | 16,100 | 141,900 | 17,600 | 144,200 |
| May | 19,700 | 158,800 | 14,700 | 128,900 | 15,400 | 144,700 | 17,600 | 149,900 |
| June | 19,200 | 159,200 | 13,500 | 112,700 | 15,600 | 142,200 | 17,400 | 150,500 |
| July | 18,400 | 130,100 | 12,200 | 102,300 | 14,100 | 130,000 | 16,900 | 149,600 |
| August | 18,500 | 115,400 | 13,400 | 105,700 | 14,600 | 120,900 | 16,000 | 149,800 |
| September | 19,100 | 118,300 | 13,800 | 109,300 | 14,500 | 124,100 | 17,100 | 154,200 |
| October | 18,900 | 121,100 | 14,000 | 110,200 | 15,300 | 126,300 | 17,200 | 159,400 |
| November | 19,400 | 147,400 | 14,800 | 112,600 | 15,100 | 127,900 | 18,200 | 160,900 |
| December | 20,900 | 157,600 | 15,600 | 114,500 | 16,200 | 130,300 | 18,300 | 161,300 |
| Average for year | 20,200 | 145,700 | 14,900 | 125,100 | 15,400 | 130,600 | 17,300 | 149,100 |

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TABLE 7.—Production of oven coke and number of plants in the United States, by type of plant

| Year | Number of active plants [1] | | Coke produced (short tons) | | Percent of production | |
|---|---|---|---|---|---|---|
| | Merchant plants | Furnace plants | Merchant plants | Furnace plants | Merchant plants | Furnace plants |
| 1929 | 41 | 46 | 12,187,439 | 41,224,387 | 22.8 | 77.2 |
| 1939 | 39 | 45 | 11,070,506 | 31,811,807 | 25.8 | 74.2 |
| 1949 | 31 | 55 | 12,112,922 | 48,109,559 | 20.1 | 79.9 |
| 1957–59 (average) | [2] 21 | [2] 54 | 7,359,600 | 53,192,300 | 12.2 | 87.8 |
| 1961 | 18 | 52 | 5,490,047 | 45,340,362 | 10.8 | 89.2 |
| 1962 | 17 | 49 | 5,438,368 | 45,660,052 | 10.6 | 89.4 |
| 1963 | 17 | 47 | 5,626,701 | 47,680,908 | 10.6 | 89.4 |
| 1964 | 17 | 47 | 6,335,528 | 54,572,863 | 10.4 | 89.6 |

[1] Includes plants operating any part of year.
[2] Dec. 31, 1959.

## PRODUCTION BY STATE

The number of States in which coke is produced seldom changes; only one State, Massachusetts, has been removed from the list of producing States in the last decade. In the early years of the coke industry, when beehive ovens were the principal suppliers of metallurgical fuel, production was limited to States producing coking coal. The expanding transportation system plus the adoption of slot ovens for the production of metallurgical coke and gas at the turn of the century resulted in the construction of slot ovens near large steel- and gas-consuming centers far distant from coking-coal fields. The principal producing States, however, always have been those in which heavy industry is concentrated, such as Pennsylvania, Ohio, Indiana, Illinois, New York, and Alabama.

Detailed statistics on the production of coke by State are given in table 8.

TABLE 8.—Production of coke in the United States, by State

(Short tons)

| State | 1957–59 (average) | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Oven coke: | | | | | |
| Alabama | 5,024,645 | 3,949,927 | 4,109,628 | 4,281,587 | 4,689,108 |
| California, Colorado, Utah | 2,701,547 | 3,017,217 | 2,406,276 | 2,408,363 | 2,935,921 |
| Connecticut, Maryland, New Jersey, New York | [1] 7,821,854 | 6,234,321 | 6,499,514 | 6,354,716 | 7,687,284 |
| Illinois | 2,291,276 | 1,841,273 | 1,917,391 | 1,871,204 | 2,298,576 |
| Indiana | 8,148,294 | 7,666,870 | 7,027,014 | 7,541,430 | 8,170,323 |
| Kentucky, Missouri, Tennessee, Texas | 2,097,415 | 1,730,069 | 1,772,084 | 2,010,349 | 2,058,916 |
| Michigan | 3,166,295 | 2,958,342 | 3,164,917 | 3,460,027 | 3,907,944 |
| Minnesota and Wisconsin | 1,058,305 | 713,769 | 757,032 | 786,923 | 932,804 |
| Ohio | 8,871,503 | 6,703,475 | 6,848,812 | 6,339,546 | 7,243,587 |
| Pennsylvania | 15,935,874 | 13,320,866 | 13,965,742 | 15,245,046 | 17,594,174 |
| West Virginia | 3,434,892 | 2,694,280 | 2,610,010 | 3,008,418 | 3,389,754 |
| Total | 60,551,900 | 50,830,409 | 51,098,420 | 53,307,609 | 60,908,391 |
| Beehive coke: | | | | | |
| Pennsylvania | 895,358 | 453,989 | 384,839 | 383,979 | 561,777 |
| Kentucky, Virginia, West Virginia | [2] 358,874 | 426,789 | 427,033 | [3] 586,719 | 674,510 |
| Total | 1,254,232 | 880,778 | 811,872 | 970,698 | 1,236,287 |
| Grand total | 61,806,132 | 51,711,187 | 51,910,292 | 54,278,307 | 62,144,678 |

[1] Includes Massachusetts.
[2] Includes Utah.
[3] Excludes West Virginia.

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## SCREENINGS OR BREEZE

The screening of the run-of-oven coke is a universal practice at oven-coke plants. The small coke which drops through ½-inch or, in some instances, ⅝-inch screens is called screenings, or breeze. This material, which generally has a higher ash and moisture content than the larger sizes, has become an important industrial fuel. Roughly 5 percent of the dry weight of coal carbonized in slot ovens is recovered as coke screenings or breeze. The yield of coke breeze ranged between 10.89 and 2.43 percent, and averaged 4.47 percent in 1964. The recovery of breeze is practiced less widely at beehive-coke plants, and only about one-half of the active plants recovered this material in 1964. At most of the beehive-coke plants, breeze is considered a waste material and is hauled away from the plant and deposited in waste banks or ash dumps. However, at beehive plants actually recovering this fuel, a yield of 3.84 percent was reported in 1964.

Roughly three-fourths of the breeze recovered at oven-coke plants is used by the producing companies on or near the premises. Until the early 1950's, the bulk of the breeze used by producing companies was utilized in steam plants, and the balance was used for miscellaneous heating purposes. In the past decade, the expansion of iron-ore agglomerating facilities at blast-furnace operations has increased coke-breeze requirements tremendously; in 1964, almost one-half of the total production at oven-coke plants was used by the producing companies in sintering operations, and only one-sixth was used for steam raising. In addition, about 10 percent of the output was used by producing companies for miscellaneous purposes at steel works; for example, for lining ingot molds, carbon runners on pig-iron ladles, soaking pits, and as a carburizing agent in steel furnaces.

Sales of breeze in 1964 increased 13 percent over those of 1963, and the average price per ton increased 4 percent. The largest market for breeze is for smelting phosphate rock in the manufacture of elemental phosphorous. Approximately 1.5 tons of coke breeze is required to produce 1 ton of elemental phosphorus and, on this basis, it is estimated that 750,000 tons of coke breeze was charged into electric furnaces to smelt phosphate rock. Other uses for breeze are in mineral-wool production, as aggregate in cement burial-vault manufacture, and for other industrial applications.

Table 9 shows production and disposal of coke breeze by State in 1964. Table 10 shows the quantities of breeze used by the producers according to major uses, the quantities sold, and the average value per ton for 1964 and selected prior years.

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**TABLE 9.—Breeze recovered at coke plants in the United States in 1964, by State**

| State | Yield per ton of coal [1] (percent) | Produced | | Used by producers— | | | | | | Sold | | On hand Dec. 31 (short tons) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Short tons | Value | In steam plants | | In agglomerating plants | | For other industrial use | | Short tons | Value | |
| | | | | Short tons | Value | Short tons | Value | Short tons | Value | | | |
| Oven coke: | | | | | | | | | | | | |
| Alabama | 5.35 | 340,757 | $2,867,248 | (2) | (2) | 96,481 | $648,767 | 34,228 | $235,123 | 186,720 | $1,811,800 | 69,329 |
| California, Colorado, Utah | 5.30 | 248,365 | 1,789,375 | | | 190,078 | 1,259,692 | 20,391 | 131,238 | (2) | (2) | 21,826 |
| Connecticut, Maryland, New Jersey, New York | 4.75 | 524,089 | 3,141,173 | 342,028 | $2,096,088 | (2) | (2) | 52,560 | 290,690 | 3,270 | 31,729 | 147,331 |
| Illinois | 5.21 | 175,273 | 1,421,137 | 19,731 | 128,696 | 101,886 | 866,622 | 17,289 | 136,439 | 27,725 | 218,900 | 36,185 |
| Indiana | 5.01 | 588,703 | 3,475,134 | 53,866 | 317,945 | 580,052 | 3,475,362 | 25,441 | 154,731 | 84,138 | 462,306 | 435,709 |
| Kentucky, Missouri, Tennessee, Texas | 5.93 | 171,816 | 1,574,443 | (2) | (2) | (2) | (2) | (2) | (2) | 133,988 | 1,191,170 | 15,115 |
| Michigan | 4.39 | 233,051 | 1,751,661 | (2) | (2) | (2) | (2) | (2) | (2) | 91,667 | 678,154 | 4,167 |
| Minnesota and Wisconsin | 5.33 | 64,227 | 384,967 | | | (2) | (2) | 50,349 | 256,424 | (2) | (2) | 57,528 |
| Ohio | 4.55 | 470,954 | 3,074,573 | 54,207 | 345,334 | 44,431 | 210,210 | 69,676 | 358,798 | 347,958 | 2,371,776 | 73,738 |
| Pennsylvania | 3.41 | 862,846 | 5,591,902 | 110,863 | 757,212 | 396,123 | 2,613,821 | 109,010 | 694,648 | 122,135 | 722,451 | 246,329 |
| West Virginia | 4.49 | 221,966 | 1,340,066 | (2) | (2) | (2) | (2) | 32,909 | 201,677 | (2) | (2) | 5,314 |
| Undistributed | | | | 51,696 | 311,103 | 354,609 | 2,488,428 | 22,162 | 169,661 | 95,451 | 770,950 | |
| Total 1964 | 4.47 | 3,902,047 | 26,411,679 | 632,391 | 3,956,378 | 1,763,660 | 11,562,902 | 434,015 | 2,629,429 | 1,093,052 | 8,259,236 | [3] 1,112,571 |
| At merchant plants | 5.93 | 523,443 | 4,190,473 | 127,402 | 1,013,600 | | | 45,352 | 241,321 | 344,104 | 2,846,742 | 139,562 |
| At furnace plants | 4.31 | 3,378,604 | 22,221,206 | 504,989 | 2,942,778 | 1,763,660 | 11,562,902 | 388,663 | 2,388,108 | 748,948 | 5,412,494 | 973,009 |
| Total 1963 | 4.72 | 3,608,806 | 25,107,301 | 609,518 | 3,847,353 | 1,794,566 | 12,553,467 | 388,499 | 2,455,041 | 954,223 | 7,000,292 | [3] 1,133,642 |
| Beehive coke: | | | | | | | | | | | | |
| Pennsylvania | 4.13 | 17,460 | 32,647 | | | | | | | 17,665 | 32,953 | |
| Kentucky and Virginia | 3.08 | 4,923 | 12,309 | | | | | | | 4,973 | 12,434 | 30 |
| Total: | | | | | | | | | | | | |
| 1964 | 3.84 | 22,383 | 44,956 | | | | | | | 22,638 | 45,387 | 30 |
| 1963 | 6.38 | 29,606 | 60,865 | | | | | | | 30,206 | 62,010 | 80 |

[1] Calculated by dividing production by coal carbonized at plants actually recovering breeze.

[2] Included with "Undistributed" to avoid disclosing individual company data.

[3] Includes some breeze resulting from the screening of coke at blast furnaces.

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**TABLE 10.—Oven- and beehive-coke breeze used and sold in the United States, by use**

(Short tons)

| Year | Used by producers— | | | Sold | Average value per ton |
|---|---|---|---|---|---|
| | In steam plants | In agglomerating plants | For other industrial use | | |
| 1947–49 (average) | 3,450,905 | • 300,000 | [1] 489,055 | 1,142,589 | $3.79 |
| 1957–59 (average) | 1,612,547 | 796,390 | 447,171 | 1,042,308 | 7.22 |
| 1961 | 619,458 | 1,518,930 | 506,746 | 807,798 | 8.30 |
| 1962 | 720,466 | 1,471,530 | 594,997 | 816,356 | 7.71 |
| 1963 | 699,518 | 1,794,566 | 388,499 | 984,429 | 7.17 |
| 1964 | 632,391 | 1,763,660 | 434,015 | 1,115,690 | 7.44 |

• Estimate.
[1] Includes 77,795 tons used to make producer or water gas.

## DISPOSAL

### CONSUMPTION AND SALES

The apparent consumption of coke in the United States in 1964, allowing for imports, exports, and change in producers' stocks, increased 14 percent over that of 1963, and was 3 percent above the 1957–59 period, but 20 percent less than the record established in 1951. Several economic and technologic factors were responsible for the large drop in coke consumption. Most of the decline, however, may be attributed to two factors—the substitution of other fuels (fuel oil and natural gas) for coke, and lower blast-furnace coke rates. For example, an average of 8 million tons of coke was used to manufacture producer and water gas and for residential heating in the 1947–49 period compared with only 318,489 tons in 1964. Because of the loss of these markets, only 9 percent of the apparent coke consumption in the United States in 1964 was used for purposes other than the smelting of iron ore in blast furnaces.

In the past decade, blast furnaces have consistently used nearly 90 percent of the coke produced. For this reason, changes in coke rates are important. In 1964, the amount of coke consumed per ton of pig iron and ferroalloys produced in blast furnaces dropped to 1,323.6 pounds. This decrease (2 percent from 1963 and 19 percent from the 1957–59 average) was attributed mainly to improved burdens (coke and iron ore) and advanced operating techniques, such as higher blast temperatures, fuel injection, and oxygen enrichment of the blast. Further improvements in blast-furnace fuel efficiency may be expected in the future, as older furnaces are replaced by modern furnaces with improved equipment and controls. The steady decline in coke rates directly affected coal and coke operations, as blast-furnace coke requirements in 1964 were 23.6 million tons lower (equivalent to 34 million tons of bituminous coal) than requirements would have been if furnaces were operated at 1951 coke rates.

Tables 13 and 14 summarize, by major end use, the disposal of oven and beehive coke in 1964. Furnace oven-coke producers use the bulk of their coke in integrated and affiliated blast furnaces, whereas merchant oven-coke producers and beehive-coke producers sell most of

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their output to blast-furnace installations, foundries, and to miscellaneous other industrial plants. Only a small fraction of the coke production, largely by merchant oven-coke plants, was marketed for residential heating, as combined sales from furnace oven-coke plants and beehive plants amounted to less than 10,000 tons. In 1964, furnace oven-coke producers used and sold 55,148,198 tons, of which 96 percent was used in company-operated blast furnaces, 1 percent was used for various other purposes, and only 3 percent was marketed or could be considered merchant sales. The distribution pattern was quite different with merchant oven-coke producers, who sold 93 percent and used only 7 percent of the total disposal. Most of the blast-furnace installations without coke-supporting facilities, as well as gray-iron foundries, nonferrous smelters, and chemical companies that use coke as a raw material, are supplied by merchant oven-coke producers. In 1964, merchant producers of oven coke sold 6,125,643 tons which was distributed as follows: 43 percent to blast-furnace operators; 41 percent to iron foundries; 12 percent for other industrial purposes; and 4 percent was sold for residential heating.

In recent years there has been a marked change in the distribution pattern of beehive coke. Until the late 1950's, virtually all beehive coke was produced for use as blast-furnace fuel. Some blast-furnace installations with integrated slot ovens, which depended on beehive coke when demand was high, were made self-sufficient by the sharp decline in coke rates. However, the increase in requirements for

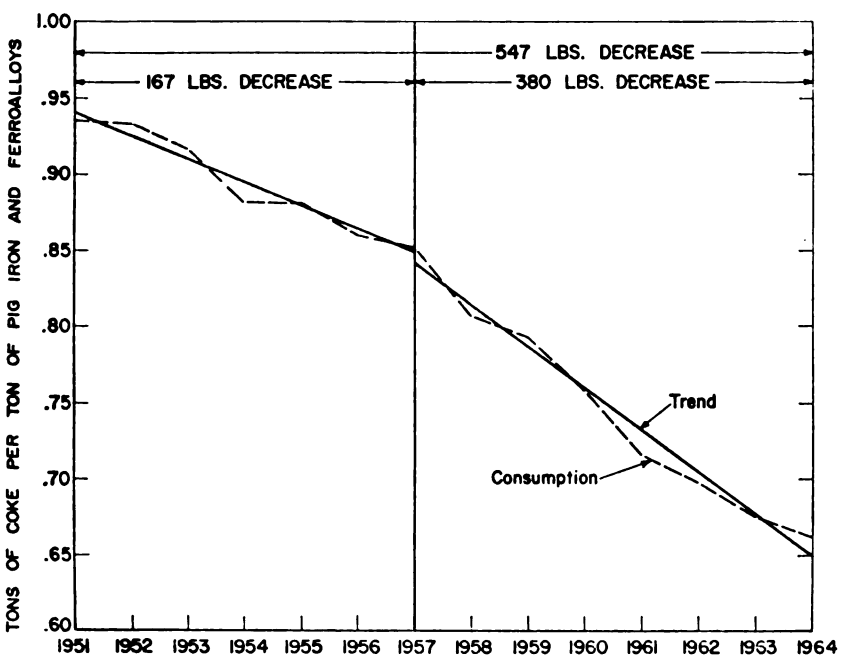


FIGURE 3.—Coke consumption per short ton of pig iron and ferroalloys produced in blast furnaces in the United States.

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chemical coke, or coke used in the production of elemental phosphorus and calcium carbide, has resulted in the shipment of beehive coke to such plants. Thus, in 1964, 44 percent of the beehive coke used and sold was distributed for various industrial purposes (including foundries) and residential heating, and 56 percent went to blast-furnace plants.

**TABLE 11.—Apparent consumption of coke in the United States**

(Short tons)

| Year | Total production | Imports | Exports | Net change in stocks | Apparent U.S. consumption [1] | Consumption | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | In iron furnaces [2] | | All other purposes | |
| | | | | | | Quantity | Percent | Quantity | Percent |
| 1937–39 (average) | 43,065,975 | 187,838 | 534,393 | +290,011 | 42,429,409 | 28,009,630 | 66.0 | 14,419,779 | 34.0 |
| 1947–49 (average) | 70,648,402 | 181,000 | 696,699 | +280,230 | 69,852,473 | 55,877,463 | 80.0 | 13,975,010 | 20.0 |
| 1957–59 (average) | 61,806,132 | 120,908 | 558,428 | +782,665 | 60,585,947 | 54,140,391 | 89.4 | 6,445,556 | 10.6 |
| 1961 | 51,711,187 | 126,518 | 445,232 | −696,215 | 52,088,688 | 46,771,105 | 89.8 | 5,317,583 | 10.2 |
| 1962 | 51,910,292 | 141,883 | 364,032 | −135,062 | 51,823,205 | 46,244,675 | 89.2 | 5,578,530 | 10.8 |
| 1963 | 54,278,307 | 152,595 | 451,241 | −1,021,880 | 55,001,541 | 48,871,568 | 88.9 | 6,129,973 | 11.1 |
| 1964 | 62,144,678 | 103,286 | 523,695 | −913,039 | 62,637,308 | 57,063,389 | 91.1 | 5,573,919 | 8.9 |

[1] Production plus imports minus exports, plus or minus net change in stocks.
[2] American Iron and Steel Institute; figures include coke consumed in manufacturing ferroalloys.

**TABLE 12.—Coke and coking coal consumed per short ton of pig iron and ferroalloys produced in the United States**

| Year | Coke per short ton of pig iron and ferroalloys [1] (pounds) | Yield of coke from coal (percent) | Coking coal per short ton of pig iron and ferroalloys (pounds calculated) | Year | Coke per short ton of pig iron and ferroalloys [1] (pounds) | Yield of coke from coal (percent) | Coking coal per short ton of pig iron and ferroalloys (pounds calculated) |
|---|---|---|---|---|---|---|---|
| 1913 | 2,172.6 | 66.9 | 2,347.5 | 1957–59 (average) | 1,634.4 | 70.0 | 2,334.9 |
| 1918 | 2,120.7 | 66.4 | 3,193.8 | 1961 | 1,432.6 | 69.7 | 2,055.4 |
| 1929 | 1,838.0 | 69.0 | 2,663.8 | 1962 | 1,395.2 | 69.5 | 2,007.5 |
| 1939 | 1,778.0 | 69.8 | 2,547.3 | 1963 | 1,350.5 | 69.5 | 1,943.2 |
| 1949 | 1,895.8 | 69.6 | 2,723.9 | 1964 | 1,323.6 | 69.6 | 1,901.7 |

[1] American Iron and Steel Institute; consumption per ton of pig iron only, excluding furnaces making ferroalloys, was 2,172.6 pounds in 1913, 2,120.7 in 1918, 1,813.3 in 1929, 1,760.0 in 1939, 1,870.4 in 1949, 1,617.0 in 1957–59 (average), 1,415.0 in 1961, 1,379.0 in 1962, 1,338.1 in 1963, and 1,310.0 in 1964.

## GEOGRAPHIC DISTRIBUTION

Total distribution of coke, exclusive of breeze, in 1964, increased 14 percent over 1963 and was the highest since 1957. The principal factor in this increase was the 15-percent gain in shipments to blast-furnace plants which utilized 91 percent of the national total. Most of the blast-furnace installations are integrated with coke ovens, and blast-furnace coke generally moves only short distances, usually by conveyor belt or company railroad within the producing establishments. Usually, about 88 percent of the coke destined to blast-furnace plants in a State is produced within the same State. Of the

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**TABLE 13.—Oven coke produced in the United States, used by producers, and sold in 1964, by State**

| State | Produced | | Used by producing companies | | | | Commercial sales | |
|---|---|---|---|---|---|---|---|---|
| | | | In blast furnaces | | For other purposes [1] | | To blast-furnace plants | |
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| Alabama | 4,689,108 | $85,549,979 | 3,660,027 | $61,548,702 | 342,670 | $7,200,313 | (2) | (2) |
| California, Colorado, Utah | 2,935,921 | 65,314,900 | 2,786,366 | 62,656,832 | 21,570 | 422,386 | | |
| Connecticut, Maryland, New Jersey, New York | 7,687,284 | 126,783,218 | 6,275,216 | 99,424,880 | 81,462 | 1,471,841 | 776,068 | $12,753,818 |
| Illinois | 2,298,576 | 43,382,598 | 2,217,211 | 40,669,286 | 75,100 | 2,616,727 | (2) | (2) |
| Indiana | 8,170,323 | 156,463,275 | 7,792,406 | 144,910,161 | 12,464 | 233,581 | (2) | (2) |
| Kentucky, Missouri, Tennessee, Texas | 2,058,916 | 37,178,811 | 690,586 | 12,691,315 | (2) | (2) | (2) | (2) |
| Michigan | 3,907,944 | 66,885,423 | (2) | (2) | 258,401 | 5,509,177 | (2) | (2) |
| Minnesota and Wisconsin | 932,804 | 18,419,554 | (2) | (2) | (2) | (2) | (2) | (2) |
| Ohio | 7,243,587 | 128,850,524 | 6,083,856 | 104,906,546 | 136,207 | 2,937,636 | 477,298 | 7,543,620 |
| Pennsylvania | 17,594,174 | 299,388,148 | 16,771,789 | 285,292,234 | 19,129 | 320,716 | 529,976 | 8,040,442 |
| West Virginia | 3,389,754 | 55,659,751 | 3,061,197 | 51,186,423 | (2) | (2) | (2) | (2) |
| Undistributed | | | 3,502,034 | 50,817,588 | 63,975 | 1,815,659 | 1,676,452 | 25,442,913 |
| Total 1964 | 60,908,391 | 1,083,876,181 | 52,840,688 | 914,103,967 | 1,010,978 | 22,528,036 | 3,459,794 | 53,780,793 |
| At merchant plants | 6,335,528 | 139,299,997 | | | 431,490 | 9,106,558 | 2,646,226 | 41,832,192 |
| At furnace plants | 54,572,863 | 944,576,184 | 52,840,688 | 914,103,967 | 579,488 | 13,421,478 | 813,568 | 11,948,601 |
| Total 1963 | 53,307,609 | 936,962,187 | 46,879,469 | 799,712,515 | 708,026 | 15,677,060 | 2,279,411 | 35,096,459 |

| State | Commercial sales—Continued | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | To foundries | | To other industrial plants [3] | | For residential heating | | Total | |
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| Alabama | 507,696 | $14,907,758 | 331,846 | $5,268,774 | (2) | (2) | 958,503 | $21,841,482 |
| California, Colorado, Utah | (2) | (2) | (2) | (2) | | | (2) | (2) |
| Connecticut, Maryland, New Jersey, New York | 310,435 | 9,155,489 | 119,670 | 2,229,614 | 95,386 | $1,724,363 | 1,301,559 | 25,863,284 |
| Illinois | | | (2) | (2) | (2) | (2) | 30,464 | 474,843 |
| Indiana | (2) | (2) | 101,295 | 1,787,243 | 9,551 | 130,357 | 584,590 | 15,245,933 |
| Kentucky, Missouri, Tennessee, Texas | (2) | (2) | (2) | (2) | (2) | (2) | (2) | (2) |
| Michigan | (1) | (2) | 150,714 | 2,448,721 | (2) | (2) | 586,677 | 15,535,938 |
| Minnesota and Wisconsin | (2) | (2) | (2) | (2) | (2) | (2) | (2) | (2) |
| Ohio | 357,551 | 10,890,430 | (2) | (2) | (2) | (2) | 1,028,474 | 21,297,028 |
| Pennsylvania | 195,277 | 5,506,984 | 218,189 | 2,860,787 | 92,450 | 1,394,044 | 1,035,892 | 17,802,257 |
| West Virginia | | | (2) | (2) | (2) | (2) | 330,646 | 4,503,605 |
| Undistributed | 1,326,572 | 41,623,982 | 534,814 | 8,409,141 | 42,425 | 656,381 | 1,996,860 | 40,210,491 |
| Total 1964 | 2,697,531 | 82,084,643 | 1,456,528 | 23,004,280 | 239,812 | 3,905,145 | 7,853,665 | 162,774,861 |
| At merchant plants | 2,506,403 | 76,655,696 | 737,509 | 12,864,270 | 235,505 | 3,829,129 | 6,125,643 | 135,181,287 |
| At furnace plants | 191,128 | 5,428,947 | 719,019 | 10,140,010 | 4,307 | 76,016 | 1,728,022 | 27,593,574 |
| Total 1963 | 2,511,183 | 75,899,475 | 1,286,760 | 20,133,197 | 515,843 | 7,875,290 | 6,593,197 | 139,004,421 |

[1] Comprises 334,163 tons valued at $10,485,581 used in foundries; 676,815 tons valued at $12,042,455 for other purposes.

[2] Included with "Undistributed" to avoid disclosing individual company data.

[3] Includes small amount to water-gas plants.

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**TABLE 14.—Beehive coke produced in the United States, used by producers, and sold in 1964, by State**

| State | Produced | | Used by producing companies— | | | | Commercial sales | |
|---|---|---|---|---|---|---|---|---|
| | | | In blast furnaces | | For other purposes | | To blast-furnace plants | |
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| Pennsylvania | 561,777 | $7,571,657 | (1) | (1) | | | 420,103 | $5,854,805 |
| Kentucky, Virginia, West Virginia | 674,510 | 11,020,424 | | | | | 278,631 | 4,313,284 |
| Total: | | | | | | | | |
| 1964 | 1,236,287 | 18,592,081 | (1) | (1) | | | 698,734 | 10,168,092 |
| 1963 | 970,596 | 14,929,656 | (1) | (1) | | | 442,940 | 6,493,931 |

| State | Commercial sales—Continued | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | To foundries | | To other industrial plants | | For residential heating | | Total | |
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| Pennsylvania | 28,545 | $532,280 | 115,975 | $1,226,026 | (2) | (2) | 564,623 | $7,613,114 |
| Kentucky, Virginia, West Virginia | 15,094 | 232,948 | 381,286 | 6,482,090 | (2) | (2) | 675,011 | 11,028,322 |
| Total: | | | | | | | | |
| 1964 | 43,639 | 765,228 | 497,261 | 7,708,116 | (2) | (2) | 1,239,634 | 18,641,436 |
| 1963 | (1) | (1) | 526,486 | 8,410,012 | (2) | (2) | 969,426 | 14,903,943 |

[1] Combined with coke sold "to blast-furnace plants" to avoid disclosing individual company data.
[2] Combined with coke sold "to other industrial plants" to avoid disclosing individual company data.

17 blast-furnace-coke-consuming States, Pennsylvania, Ohio, and Indiana consumed 56 percent of the total shipments of blast-furnace coke.

Unlike blast-furnace coke which is produced within the consuming States, foundry-coke shipments are widespread and many involve long-distance rail hauls. The principal consumers of foundry coke are the automotive, farm machinery, machine tool, heavy machinery, railroad, and electrical equipment industries. These industries are concentrated in such cities as Detroit, Flint, Chicago, Cleveland, Birmingham, Pittsburgh, Buffalo, and Milwaukee, and account for the large tonnages of foundry coke consumed in the States where these cities are located. A major factor in the 12-percent increase in foundry-coke shipments over those of 1963 was the increase in castings required for the automotive industry.

Coke utilized for miscellaneous industrial applications is included in shipments to other industrial plants. This classification includes shipments to nonferrous smelters, alkali plants (lime burning), chemical manufacturers (calcium carbide and elemental phosphorus), and a variety of other industrial plants. The total shipments for these uses represented 4 percent of the total distribution. The use of coke for residential heating continued to decline and amounted to less than 1 percent of the total.

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Table 15 summarizes the distribution of oven and beehive coke by major end uses and final destination. Shipments in certain States have been grouped under the designation of "Undistributed" to avoid the disclosure of individual company data. Also, the small shipments to producer-gas and water-gas plants are no longer considered a major end use, and are included with shipments to other industrial plants.

**TABLE 15.—Distribution of oven and beehive coke and breeze in 1964** [1]

(Short tons)

| Consuming State | Coke | | | | | Breeze |
|---|---|---|---|---|---|---|
| | To blast-furnace plants | To foundries | To other industrial plants | For residential heating | Total | |
| Alabama | 3,700,501 | 193,968 | 280,605 | 9,663 | 4,184,737 | 214,090 |
| Alaska | | | (2) | | (2) | |
| Arizona | | (2) | (2) | | 1,457 | |
| Arkansas | | 1,475 | 2,458 | | 3,933 | (2) |
| California | (2) | 58,704 | (2) | | 1,357,903 | 79,520 |
| Colorado | (2) | 14,305 | 35,902 | (2) | 630,002 | (2) |
| Connecticut | | (2) | 49,169 | (2) | 91,573 | 47,966 |
| Delaware | | | 1,825 | | 1,825 | 1,086 |
| District of Columbia | | | | | | (2) |
| Florida | | (2) | 33,387 | (2) | 38,218 | 39,639 |
| Georgia | | 12,454 | (2) | (2) | 16,689 | 950 |
| Idaho | | 194 | 112,444 | | 112,638 | (2) |
| Illinois | 3,982,658 | 266,562 | 98,494 | 5,732 | 4,353,446 | 222,307 |
| Indiana | 7,344,734 | 144,060 | 79,593 | 8,852 | 7,577,239 | 683,212 |
| Iowa | | 80,025 | 11,027 | 371 | 91,423 | (2) |
| Kansas | | (2) | (2) | | 9,661 | 1,963 |
| Kentucky | (2) | 38,373 | 237,682 | (2) | 1,227,579 | 43,722 |
| Louisiana | | (2) | 52,541 | (2) | 60,915 | 1,120 |
| Maine | | (2) | (2) | (2) | (2) | |
| Maryland | (2) | (2) | 20,643 | | 3,653,810 | (2) |
| Massachusetts | | (2) | (2) | (2) | (2) | |
| Michigan | (2) | 747,517 | 256,093 | (2) | 5,172,617 | 243,025 |
| Minnesota | (2) | 21,353 | 15,318 | (2) | 411,088 | 42,994 |
| Mississippi | | (2) | (2) | | (2) | (2) |
| Missouri | | 26,841 | (2) | (2) | 50,841 | 1,585 |
| Montana | | 227 | 22,691 | | 22,918 | 43,514 |
| Nebraska | | 4,747 | 11,773 | | 16,520 | (2) |
| Nevada | | (2) | | | (2) | |
| New Hampshire | | (2) | | (2) | (2) | |
| New Jersey | | 141,800 | (2) | (2) | 226,082 | 47,916 |
| New Mexico | | | (2) | (2) | (2) | (2) |
| New York | 3,151,772 | 103,129 | 74,053 | 9,331 | 3,338,285 | 256,977 |
| North Carolina | | 22,428 | (2) | (2) | 43,971 | 20,869 |
| North Dakota | | (2) | | | (2) | |
| Ohio | 9,820,994 | 351,196 | 258,563 | 5,104 | 10,435,857 | 399,597 |
| Oklahoma | | (2) | (2) | | 4,806 | 6,657 |
| Oregon | | 4,464 | 26,664 | | 31,128 | (2) |
| Pennsylvania | 14,620,838 | 168,863 | 194,797 | 41,890 | 15,026,388 | 727,246 |
| Rhode Island | | (2) | (2) | (2) | (2) | |
| South Carolina | | (2) | 25,610 | (2) | 36,075 | 11,695 |
| South Dakota | | (2) | (2) | (2) | (2) | (2) |
| Tennessee | (2) | 83,868 | 217,030 | (2) | 316,736 | 132,049 |
| Texas | (2) | 84,154 | 47,024 | (2) | 878,062 | 76,222 |
| Utah | (2) | (2) | 27,820 | | 996,669 | (2) |
| Vermont | | 2,862 | (2) | (2) | 3,576 | |
| Virginia | (2) | 62,613 | 69,842 | (2) | 167,446 | 2,448 |
| Washington | | 4,183 | 4,585 | | 8,768 | (2) |
| West Virginia | (2) | 8,718 | 46,430 | (2) | 1,675,527 | 260,320 |
| Wisconsin | | 151,947 | 1,378 | 6,646 | 159,971 | (2) |
| Wyoming | | | 4,830 | | 4,830 | 140 |
| Undistributed | 14,298,561 | 161,472 | 176,195 | 82,657 | 108,063 | 315,866 |
| Total | 56,920,058 | 2,962,502 | 2,496,466 | 170,246 | 62,549,272 | 3,924,695 |
| Exported | 79,158 | 112,831 | 122,999 | 80,705 | 395,693 | 21,061 |
| Grand total | 56,999,216 | 3,075,333 | 2,619,465 | 250,951 | 62,944,965 | 3,945,756 |

[1] Based upon reports from producers showing destination and principal end use of coke used and sold. Does not include imported coke, which totaled 103,286 tons in 1964.
[2] Included with "Undistributed" to avoid disclosing individual company data.

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## STOCKS OF COKE AND BREEZE

Producers' stocks of coke which usually decline during periods of high industrial activity, decreased 32 percent during 1964. As a rule, producers endeavor to keep stocks to a minimum by adjusting production to demand. This procedure, however, can be followed only to a certain point because of the nature of the refractory material in slot ovens. Such ovens cannot be stopped and started intermittently without serious damage to this material, and, for this reason, the producing companies are reluctant to shut down ovens.

Demand for coke began to decline in 1958, following the record production in 1957, and producers' stocks rose steadily. They reached an alltime peak in November 1959 when they totaled more than 5.1 million tons. For the next 3 years they varied between 3.6 and 4.8 million tons, and since the beginning of 1963 there has been a gradual decline at both merchant and furnace oven-coke plants.

Although stocks at merchant plants dropped 72 percent between January 1963 and December 1964, reserves at the close of 1964 were equal to 14.3 days' production. Stocks at furnace plants at the close of 1964 were equal to 10.6 days' production and consisted mainly of blast-furnace coke. Stocks of coke breeze at oven-coke plants varied only slightly from those of the preceding year. Beehive-coke-plant operators rarely stock coke, and only an insignificant amount was in reserve at the end of the year.

Detailed data on producers' stocks of coke and breeze are shown in table 16.

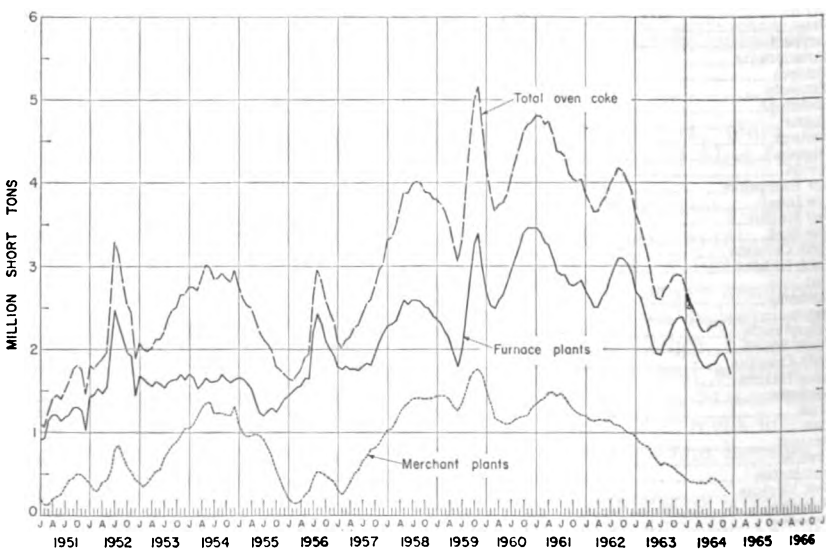


FIGURE 4.—Producers' stocks of oven coke in the United States, by month.

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**TABLE 16.—Producers' stocks of coke and breeze in the United States on Dec. 31, 1964, by State**

(Short tons)

| State | Coke | | | | Breeze |
|---|---|---|---|---|---|
| | Blast furnace | Foundry | Residential heating and other | Total | |
| Oven coke: | | | | | |
| Alabama | 316,960 | 10,526 | 44,167 | 371,653 | 69,329 |
| California, Colorado, Utah | 217,314 | | | 217,314 | 21,826 |
| Connecticut, Maryland, New Jersey, New York | 331,372 | 19,871 | 24,825 | 376,068 | 147,331 |
| Illinois | 49,925 | 1,912 | 1,790 | 53,627 | 36,185 |
| Indiana | 194,324 | 16,918 | 1,514 | 212,756 | 435,709 |
| Kentucky, Missouri, Tennessee, Texas | 33,262 | 18,932 | 10,074 | 62,268 | 15,115 |
| Michigan | 52,727 | 1,766 | 14,667 | 69,160 | 4,167 |
| Minnesota and Wisconsin | 72,295 | 28,676 | 39,295 | 140,266 | 57,528 |
| Ohio | 182,498 | 3,427 | 14,559 | 200,484 | 73,738 |
| Pennsylvania | 212,045 | 13,768 | 8,441 | 234,254 | 246,329 |
| West Virginia | 32,716 | | | 32,716 | 5,314 |
| Total 1964 | 1,695,438 | 115,796 | 159,332 | 1,970,566 | 1,112,571 |
| At merchant plants | 38,440 | 99,963 | 123,684 | 262,087 | 139,562 |
| At furnace plants | 1,656,998 | 15,833 | 35,648 | 1,708,479 | 973,009 |
| Total 1963 | 2,390,983 | 139,410 | 348,428 | 2,878,821 | 1,133,642 |
| Beehive coke: | | | | | |
| Pennsylvania | 892 | | | 892 | |
| Kentucky, Virginia, West Virginia | 118 | | 316 | 434 | 30 |
| Total: | | | | | |
| 1964 | 1,010 | | 316 | 1,326 | 30 |
| 1963 | 4,834 | | 1,276 | 6,110 | 80 |

**TABLE 17.—Producers' month-end stocks of oven coke in the United States**

(Short tons)

| Month | At merchant plants | | At furnace plants | | Total | |
|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| January | 937,903 | 447,093 | 2,688,158 | 2,264,672 | 3,626,061 | 2,711,765 |
| February | 871,464 | 410,554 | 2,620,780 | 2,146,261 | 3,492,244 | 2,556,815 |
| March | 845,617 | 410,499 | 2,472,069 | 2,048,118 | 3,317,686 | 2,458,617 |
| April | 829,026 | 392,241 | 2,280,177 | 1,910,015 | 3,109,203 | 2,302,256 |
| May | 732,717 | 405,581 | 2,047,941 | 1,812,872 | 2,780,658 | 2,218,453 |
| June | 660,119 | 395,908 | 1,947,240 | 1,788,316 | 2,607,359 | 2,184,224 |
| July | 663,048 | 451,203 | 1,932,980 | 1,825,530 | 2,596,028 | 2,276,733 |
| August | 638,097 | 451,172 | 2,070,619 | 1,842,343 | 2,708,716 | 2,293,515 |
| September | 610,767 | 417,106 | 2,166,067 | 1,922,885 | 2,776,834 | 2,339,991 |
| October | 570,464 | 351,404 | 2,300,830 | 1,970,993 | 2,871,294 | 2,322,397 |
| November | 523,270 | 304,193 | 2,375,864 | 1,890,459 | 2,899,134 | 2,194,652 |
| December | 484,692 | 262,087 | 2,394,129 | 1,708,479 | 2,878,821 | 1,970,566 |

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## VALUE AND PRICE

The average values and prices of oven and beehive coke produced and sold, as reported by the producing companies, are shown in tables 18 and 19. The average values at plants of oven and beehive coke produced are based on reports from the producing companies that showed receipts, f.o.b. plant, for commercial sales of coke, and the prevailing market value assigned by the producers for coke consumed by the producing companies.

The average value of oven and beehive coke produced rose slightly over the 1963 figure, but was well below the 1957–59 average. The average receipts of oven and beehive coke from commercial sales declined from 1963, but were 4 percent above the 1957–59 average. Generally, coke prices follow delivered coal costs, but other factors, such as demand and labor costs, were responsible for the slightly higher selling prices for the various grades of coke in 1964. The only grade of oven coke that was higher than the 1957–59 average was that sold to foundries. Prices of beehive coke sold to furnace plants and for residential heating have declined below the 1957–59 average, whereas increases were registered on sales to foundries and other industrial plants. The large variance in prices between blast furnace and foundry is due to a number of factors, such as lower yields of coke from coking-coal admixtures because of higher proportions of low-volatile coals; longer coking cycles which reduce productivity; and larger minimum sizes. The difference in prices of oven and beehive-foundry coke is due largely to transportation charges on coal and/or coke.

**TABLE 18.—Average value per short ton of coke produced in the United States and average receipts per short ton from coke sold (commercial sales)**

| Year | Value per ton produced | | | Receipts per ton sold | | |
|---|---|---|---|---|---|---|
| | Oven coke | Beehive coke | Total | Oven coke | Beehive coke | Total |
| 1957–59 (average) | $18.14 | $14.70 | $18.07 | $20.06 | $14.67 | $19.29 |
| 1961 | 17.80 | 15.08 | 17.76 | 21.14 | 15.13 | 20.55 |
| 1962 | 18.14 | 14.96 | 18.09 | 21.19 | 14.95 | 20.62 |
| 1963 | 17.58 | 15.38 | 17.54 | 21.08 | 15.48 | 20.53 |
| 1964 | 17.80 | 15.04 | 17.74 | 20.73 | 15.00 | 20.04 |

**TABLE 19.—Average receipts per short ton of coke sold (commercial sales) in the United States, by use**

| Year | Oven coke | | | | Beehive coke | | | |
|---|---|---|---|---|---|---|---|---|
| | To blast-furnace plants | To foundries | To other industrial plants [1] | For residential heating | To blast-furnace plants | To foundries | To other industrial plants [1] | For residential heating |
| 1957–59 (average) | $15.85 | $29.39 | $15.87 | $17.15 | $14.84 | $16.72 | $14.04 | $11.64 |
| 1961 | 15.98 | 30.07 | 16.67 | 17.12 | 15.94 | 16.02 | 14.95 | 16.87 |
| 1962 | 15.98 | 30.25 | 16.37 | 14.10 | 14.35 | 14.15 | 15.05 | 15.63 |
| 1963 | 15.40 | 30.22 | 15.65 | 15.27 | 14.06 | 14.75 | 15.99 | 9.35 |
| 1964 | 15.54 | 30.43 | 15.79 | 16.28 | 14.34 | 17.54 | 15.68 | 7.83 |

[1] Includes water-gas plants.

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## FOREIGN TRADE

### IMPORTS

Although imports of coke are important to certain local areas, such as the northwestern part of the United States, they are not a significant factor in the overall supply. For many years the total quantity of coke imported has amounted to less than one day's production. The 1964 total was the lowest since 1946, principally because of the virtual termination of imports through the Michigan Customs District.

More than one-half of the coke imported in 1964 and prior years has entered the United States through the Montana-Idaho Customs District. This coke is used mainly in nonferrous smelters and originates in the Canadian Province of British Columbia. Imports from countries other than Canada are usually small, and in 1964 were insignificant. In some instances in past years, special-purpose carbons from some countries have been classified as coke and included under imports of coke.

Statistics on coke imports in 1964 and two prior years are given in table 20.

**TABLE 20.—Coke imported for consumption in the United States, by country and by customs district**

| | 1962 | | 1963 | | 1964 | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| Country or area: | | | | | | |
| North America: | | | | | | |
| Canada | 132,076 | $1,663,693 | 142,952 | $1,731,011 | 101,375 | $1,329,897 |
| Dominican Republic | | | 5 | 419 | | |
| Netherlands Antilles | 73 | 787 | 100 | 1,071 | | |
| Total | 132,149 | 1,664,480 | 143,057 | 1,732,501 | 101,375 | 1,329,897 |
| South America: British Guiana | | | | | 40 | 608 |
| Europe: | | | | | | |
| Belgium-Luxembourg | 720 | 21,029 | 220 | 6,365 | 220 | 7,296 |
| Germany, West | 69 | 18,297 | 782 | 81,322 | 1,651 | 170,806 |
| Netherlands | | | 1,792 | 112,917 | | |
| United Kingdom | 8,939 | 151,361 | 6,744 | 113,942 | | |
| Yugoslavia | 6 | 173 | | | | |
| Total | 9,734 | 190,860 | 9,538 | 314,546 | 1,871 | 178,102 |
| Grand total | 141,883 | 1,855,340 | 152,595 | 2,047,047 | 103,286 | 1,508,607 |
| Customs District: | | | | | | |
| Buffalo | 2,264 | 20,023 | 20,896 | 144,132 | 25,781 | 174,588 |
| Hawaii | 759 | 22,413 | 220 | 6,365 | 220 | 7,296 |
| Maine and New Hampshire | 106 | 1,687 | 96 | 1,508 | 89 | 1,391 |
| Maryland | | | 100 | 1,071 | | |
| Michigan | 45,519 | 394,972 | 39,097 | 344,347 | 57 | 960 |
| Minnesota | 102 | 879 | | | | |
| Montana and Idaho | 65,597 | 992,862 | 66,420 | 988,659 | 59,811 | 906,638 |
| New Orleans | 3,698 | 78,993 | 9,266 | 298,725 | 1,333 | 139,886 |
| New York | 79 | 960 | | | | |
| Puerto Rico | | | 5 | 419 | | |
| Sabine | | | 52 | 9,456 | 318 | 30,920 |
| St. Lawrence | 394 | 9,491 | 363 | 11,830 | 292 | 10,286 |
| San Francisco | 547 | 4,626 | | | | |
| South Carolina | 5,271 | 89,281 | | | | |
| Vermont | 35 | 585 | 76 | 1,258 | 47 | 777 |
| Washington | 17,602 | 238,568 | 16,004 | 239,277 | 15,338 | 235,865 |
| Total | 141,883 | 1,855,340 | 152,595 | 2,047,047 | 103,286 | 1,508,607 |

Source: Bureau of the Census.

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## EXPORTS

The United States has always been a net exporter of coke. In 1964, this country exported over five times the quantity of coke imported, with an overall value over 6.5 times greater. Increased shipments to Canada and South America were the principal factors in the 16-percent gain in exports over 1963. Canada is by far the principal market for American coke, receiving 86 percent of the total export shipments in 1964. Shipments to European countries virtually ceased in 1964; less than 500 tons was distributed to three countries compared with nearly 47,000 tons sent to seven countries in 1963. Exports to Africa and Australia were small, and, of the five countries in Asia importing American coke, only the Philippines and Japan received more than 1,000 tons.

Exports of coke for 1962–64, by country and by customs district, are shown in table 21.

**TABLE 21.—Coke exported from the United States, by country and by customs district**

| | 1962 | | 1963 | | 1964 | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| Country or area: | | | | | | |
| North America: | | | | | | |
| Canada | 311,177 | $6,052,007 | 344,456 | $6,502,346 | 449,759 | $8,268,152 |
| Mexico | 9,878 | 267,297 | 13,633 | 331,863 | 19,116 | 537,208 |
| Panama | 306 | 9,131 | 584 | 10,532 | 411 | 8,574 |
| West Indies: | | | | | | |
| Trinidad and Tobago | 113 | 2,573 | 59 | 1,299 | 173 | 5,712 |
| Other West Indies | 291 | 6,946 | 30 | 1,300 | 90 | 2,758 |
| Other North America | 220 | 5,205 | 98 | 1,671 | ---------- | ---------- |
| Total | 321,985 | 6,343,159 | 358,800 | 6,849,011 | 469,549 | 8,822,404 |
| South America: | | | | | | |
| Argentina | ---------- | ---------- | ---------- | ---------- | 10,098 | 288,480 |
| Bolivia | ---------- | ---------- | 131 | 2,360 | ---------- | ---------- |
| Brazil | 9,923 | 274,066 | 5,730 | 159,424 | 7,637 | 323,270 |
| Chile | 249 | 7,330 | 900 | 22,743 | 146 | 6,464 |
| Colombia | 251 | 4,983 | 98 | 2,025 | ---------- | ---------- |
| Ecuador | 175 | 3,289 | 243 | 5,682 | 213 | 4,811 |
| Peru | ---------- | ---------- | 74 | 3,138 | 7,221 | 93,318 |
| Venezuela | 263 | 7,833 | 24,879 | 265,603 | 19,962 | 277,838 |
| Total | 10,861 | 297,501 | 32,055 | 460,975 | 45,277 | 994,181 |
| Europe: | | | | | | |
| Denmark | 325 | 6,792 | ---------- | ---------- | ---------- | ---------- |
| France | ---------- | ---------- | ---------- | ---------- | 37 | 696 |
| Germany, West | 14,862 | 167,686 | 446 | 5,700 | ---------- | ---------- |
| Greece | ---------- | ---------- | 131 | 1,160 | ---------- | ---------- |
| Italy | 15 | 396 | 15,233 | 201,836 | 243 | 5,789 |
| Norway | ---------- | ---------- | 7,388 | 96,712 | ---------- | ---------- |
| Portugal | 10,766 | 158,000 | 10,039 | 189,424 | ---------- | ---------- |
| United Kingdom | 424 | 8,330 | 632 | 10,146 | 139 | 3,264 |
| Yugoslavia | ---------- | ---------- | 13,100 | 136,900 | ---------- | ---------- |
| Total | 26,392 | 341,204 | 46,969 | 641,878 | 419 | 9,749 |
| Asia: | | | | | | |
| India | 1,386 | 27,307 | 708 | 15,101 | 193 | 7,485 |
| Iran | ---------- | ---------- | 16 | 714 | ---------- | ---------- |
| Japan | 1,142 | 31,039 | 12,365 | 341,643 | 6,762 | 195,334 |
| Nansei and Nanpo Islands | ---------- | ---------- | ---------- | ---------- | 16 | 368 |
| Philippines | 2,190 | 80,358 | 300 | 7,699 | 1,189 | 34,093 |
| Saudi Arabia | ---------- | ---------- | ---------- | ---------- | 6 | 256 |
| Taiwan | 61 | 899 | ---------- | ---------- | ---------- | ---------- |
| Total | 4,779 | 139,603 | 13,389 | 365,157 | 8,166 | 237,536 |

See footnote at end of table.

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TABLE 21.—Coke exported from the United States, by country and by customs district—Continued

| | 1962 | | 1963 | | 1964 | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| Country or area—Continued | | | | | | |
| Africa: | | | | | | |
| Congo (Léopoldville) | | | 28 | $986 | | |
| Kenya | | | | | 41 | $965 |
| Total | | | 28 | 986 | 41 | 965 |
| Oceania: Australia | 15 | $570 | | | 243 | 27,762 |
| Grand total | 364,032 | 7,122,037 | 451,241 | 8,318,007 | 523,695 | 10,092,597 |
| Customs District: | | | | | | |
| Buffalo | 69,242 | 1,514,987 | 88,627 | 1,905,554 | 148,097 | 3,151,149 |
| Chicago | 81,681 | 1,208,950 | 104,193 | 1,536,822 | 105,163 | 1,524,049 |
| Dakota | 8,308 | 248,334 | 7,431 | 234,470 | 9,023 | 256,981 |
| Duluth and Superior | 3,029 | 79,701 | 3,191 | 74,545 | 2,441 | 64,855 |
| Laredo | 8,908 | 240,493 | 12,152 | 293,974 | 17,992 | 500,172 |
| Maryland | 100 | 4,338 | | | 298 | 10,705 |
| Massachusetts | 65 | 1,750 | | | | |
| Michigan | 138,856 | 2,755,363 | 122,373 | 2,385,340 | 168,081 | 2,868,388 |
| Mobile | 11,245 | 170,735 | 1,204 | 31,035 | 15,377 | 238,204 |
| Montana and Idaho | | | 441 | 10,930 | | |
| New Orleans | 724 | 20,313 | 1,011 | 24,193 | 866 | 21,009 |
| New York | 9,243 | 266,340 | 42,034 | 505,322 | 17,309 | 507,062 |
| Ohio | 2,334 | 47,894 | 6,522 | 56,890 | | |
| Oregon | 1,136 | 30,939 | 12,200 | 339,780 | 6,965 | 221,921 |
| Philadelphia | 19,408 | 290,898 | 35,447 | 568,332 | 13,358 | 276,750 |
| Sabine | 551 | 9,250 | | | | |
| St. Lawrence | 4,010 | 69,339 | 8,552 | 190,439 | 13,130 | 273,320 |
| San Diego | 858 | 22,151 | 1,332 | 32,544 | 960 | 30,416 |
| Vermont | 96 | 1,469 | 490 | 8,820 | | |
| Virginia | 113 | 2,573 | 59 | 1,299 | 58 | 1,123 |
| Washington | 3,787 | 129,075 | 3,295 | 102,912 | 4,003 | 133,849 |
| Other districts | 338 | 7,145 | 597 | 14,806 | 574 | 12,644 |
| Total | 364,032 | 7,122,037 | 451,241 | 8,318,007 | 523,695 | 10,092,597 |

Source: Bureau of the Census.

## WORLD PRODUCTION

World production of hard or metallurgical coke in 1964 was estimated at 327 million tons, an increase of 6 percent over the estimated output for 1963. This increase was attributed to a more-or-less general rise in coke production throughout the world, as all continents, though not all countries, had larger outputs than in the previous year.

Europe led the world in production with nearly two-thirds of the total output. European production increased 4 percent, mainly because of substantial production increases in the U.S.S.R., West Germany, and the United Kingdom. Although there were 18 coke-producing countries in Europe, the three countries mentioned accounted for two-thirds of Europe's total.

Output of coke and breeze in the Soviet Union, currently the world's largest producer, reached 75 million tons, more than one-third of the European total, and nearly one-fourth of the world total. This record Soviet output was 6 percent higher than the 1963 figure and was 20 percent above that of 1960. It was, however, nearly 10 million tons less than the record output of coke and breeze established in the United States in 1951. The substantial increases in production in the U.S.S.R. are attributed to the all-out Soviet effort in recent years to increase the productive capacity of heavy industries which, basically,



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are geared to the production of iron and steel. Although table 22 shows that production in the U.S.S.R. in 1964 exceeded that of the United States by 12.5 million tons, the actual difference in output between the two countries was only 8.5 million tons, as breeze production was not included in the U.S. figure.

The United States, with 19 percent of the world total, ranked second in output, while West Germany, with 15 percent, ranked third. Both countries registered production increases in 1964, principally because of increased demands for blast-furnace coke. United States output increased nearly 8 million tons, or 14 percent, compared with an increase of 1.6 million tons, or 4 percent, in West Germany.

Other ranking coke-producing countries, in order, were the United Kingdom, China, France, Poland, Japan, and Czechoslovakia. Production trends in these countries differ somewhat, with output in the United Kingdom and France declining slightly or remaining at about the same level over the past 5 years, while Japan, Poland, and Czechoslovakia had sizable production increases. The largest increases were recorded in Japan, where production has increased 51 percent since 1960, and 15 percent over 1963, an average of 10.2 percent per year during the past 5 years. Estimated production in China has remained at the same level since 1961. Data on China, however, cannot be considered too reliable because very little information has been published on China's industrial activity.

In addition to the high-temperature metallurgical coke produced in conventional slot- and beehive-coke ovens, nearly 50 million tons of other coke was produced by carbonizing a wide variety of coals, both coking and noncoking, at high, medium, and low temperatures in vertical and horizontal retorts, or in types of carbonizing equipment other than conventional coke ovens. This coke, which is commonly referred to as soft coke, and is not suitable for most metallurgical applications, is used principally for domestic heating, chemical processing, and the production of producer and water gas. When produced as char, the material generally is briquetted and then used for domestic fuel.

Europe produced four-fifths of the world's soft coke, and Asia supplied most of the remainder. The leading European producers were East Germany and the United Kingdom, with a combined output equal to 43 percent of the world total and 53 percent of Europe's production. East Germany's output of soft coke was principally lignite in the form of carbonized briquets. Production in the United Kingdom consisted principally of carbonized briquets or semicoke produced in retorts from bituminous coal. Both countries used these fuels principally for domestic heating. Other countries with relatively large outputs of soft coke were West Germany, Japan, Czechoslovakia, India, and Poland. Only a few hundred thousand tons was produced in the United States.

Table 23 shows production of gashouse, low-, and medium-temperature coke.

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**TABLE 22.—World production of oven and beehive coke (excluding breeze), by country [1]**

(Thousand short tons)

| Country | 1960 | 1961 | 1962 | 1963 | 1964 p |
|---|---|---|---|---|---|
| North America: | | | | | |
| Canada [2] | 3,873 | 3,900 | 4,022 | 4,281 | 4,343 |
| Mexico | 481 | 785 | 854 | 995 | [3] 1,014 |
| United States | 57,229 | 51,711 | 51,910 | 54,278 | 62,145 |
| Total | 61,583 | 56,396 | 56,786 | 59,554 | 67,502 |
| South America: | | | | | |
| Argentina e | 280 | 440 | 550 | 660 | 720 |
| Brazil | 776 | 771 | 794 | 740 | 788 |
| Chile | 258 | 224 | 260 | 274 | 271 |
| Colombia | 463 | 358 | 397 | 441 | 463 |
| Peru | 33 | 40 | 44 | 44 | 31 |
| Total | 1,810 | 1,833 | 2,045 | 2,159 | 2,273 |
| Europe: | | | | | |
| Austria | 2,255 | 1,965 | 1,824 | 1,801 | 1,771 |
| Belgium | 8,295 | 7,948 | 7,931 | 7,941 | 8,155 |
| Bulgaria | 22 | 22 | 9 | 141 | e 140 |
| Czechoslovakia | 9,323 | 9,410 | 9,844 | 10,250 | 10,385 |
| Finland | 11 | e 20 | e 20 | e 11 | e 11 |
| France [3] | 15,030 | 14,859 | 14,902 | 14,842 | 15,367 |
| Germany: | | | | | |
| East [4] | 1,111 | 1,135 | 1,136 | 1,149 | [5] 1,149 |
| West [6] | 49,252 | 48,992 | 47,504 | 46,069 | 47,691 |
| Hungary | 550 | 658 | 721 | 728 | 733 |
| Italy | 4,095 | 4,296 | 4,769 | 5,065 | 5,153 |
| Netherlands [3] | 4,979 | 5,020 | 4,711 | 4,707 | 4,976 |
| Poland | 12,437 | 13,170 | 13,859 | 14,549 | 14,359 |
| Rumania | 904 | 1,036 | 1,233 | 1,258 | 1,263 |
| Spain | 2,837 | 2,876 | 3,018 | 3,034 | 2,821 |
| Sweden | 148 | 293 | 379 | 378 | e 410 |
| U.S.S.R. [3] | 61,986 | 64,600 | 67,163 | 70,408 | e 74,600 |
| United Kingdom | 21,094 | 19,968 | 17,430 | 17,408 | 18,982 |
| Yugoslavia | 1,194 | 1,211 | 1,220 | 1,202 | 1,297 |
| Total | 195,523 | 197,479 | 197,673 | 200,941 | 209,263 |
| Asia: | | | | | |
| China e | 27,600 | 16,500 | 16,500 | 16,500 | 16,500 |
| India | 5,267 | 8,264 | 7,769 | 8,102 | 8,069 |
| Iran [7] | 22 | 22 | 14 | e 22 | e 22 |
| Japan | 9,424 | 12,030 | 12,729 | 12,398 | 14,256 |
| Korea, North e | 900 | 990 | 1,200 | 1,300 | 1,500 |
| Turkey | 583 | 580 | 565 | 907 | 947 |
| Total | 43,800 | 38,386 | 38,777 | 39,229 | 41,294 |
| Africa: | | | | | |
| Rhodesia (formerly Southern) | 161 | 212 | 112 | e 116 | 143 |
| South Africa, Republic of | 2,364 | 2,420 | 2,429 | 2,520 | 2,636 |
| Total | 2,525 | 2,632 | 2,541 | 2,636 | 2,779 |
| Oceania: | | | | | |
| Australia | 2,949 | 3,038 | 3,106 | 3,192 | 3,407 |
| New Caledonia e | 77 | 77 | 77 | 77 | 77 |
| New Zealand | 7 | 7 | 7 | 7 | 7 |
| Total | 3,033 | 3,122 | 3,190 | 3,276 | 3,491 |
| World total | 308,274 | 299,848 | 301,012 | 307,795 | 326,602 |

e Estimate. p Preliminary.
[1] Includes revisions of data published previously.
[2] Includes breeze and a negligible amount of gashouse coke.
[3] Includes breeze.
[4] High-temperature coke from lignite.
[5] 1963 data.
[6] Includes electrode coke but excludes an estimated 100,000 tons of low-temperature coke.
[7] Year ended March 20 of year following that stated.

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**TABLE 23.—World production of gashouse, low-, and medium-temperature coke (excluding breeze), by country [1]**

(Thousand short tons)

| Country [2] | 1960 | 1961 | 1962 | 1963 | 1964 [p] |
|---|---|---|---|---|---|
| North America: United States | W | W | 164 | 160 | 203 |
| Total [e] [2] | 230 | 130 | 275 | 270 | 315 |
| South America: | | | | | |
| Argentina [e] | 66 | 66 | 66 | 66 | 66 |
| Brazil | e280 | 314 | e310 | e310 | e310 |
| Chile | e94 | e94 | e94 | 109 | 91 |
| Uruguay | 35 | 25 | 25 | 23 | 23 |
| Total | 475 | 499 | 495 | 508 | 490 |
| Europe: | | | | | |
| Austria | 289 | 280 | 347 | 378 | 358 |
| Czechoslovakia: | | | | | |
| Gashouse | 686 | 565 | 571 | 497 | 336 |
| Lignite | 2,399 | 2,375 | 2,327 | 2,330 | e2,315 |
| Denmark | 439 | 446 | 461 | 453 | e460 |
| Finland | 152 | e130 | e145 | e170 | e150 |
| France: | | | | | |
| Gashouse | 766 | 474 | 272 | 152 | 67 |
| Low-temperature | 328 | 306 | 297 | 299 | 326 |
| Germany: | | | | | |
| East: | | | | | |
| Gashouse [3] | 3,534 | 3,400 | 3,441 | 3,596 | e3,595 |
| Lignite | 7,376 | 7,314 | 7,308 | 7,194 | e7,195 |
| West: | | | | | |
| Gashouse | 5,754 | 5,454 | 5,467 | 5,390 | 5,415 |
| Lignite | 664 | 662 | 661 | 661 | 657 |
| Low-temperature | 80 | 98 | 114 | 111 | 94 |
| Greece | 25 | 25 | 24 | 23 | e15 |
| Hungary | 547 | 534 | 559 | 535 | e520 |
| Ireland (Eire) | 106 | 103 | 97 | e110 | e115 |
| Italy | 899 | 862 | 855 | 793 | 650 |
| Luxembourg | 41 | 40 | 40 | 40 | e30 |
| Netherlands [3] | 322 | 257 | 220 | 195 | 121 |
| Norway [3] | 52 | 50 | 50 | 40 | 50 |
| Poland: | | | | | |
| Gashouse | 1,077 | 1,122 | 1,194 | 1,273 | e1,275 |
| Low-temperature | e220 | e220 | 276 | 280 | e280 |
| Portugal | 43 | 44 | 34 | 28 | 11 |
| Spain | 273 | 279 | 256 | 219 | 186 |
| Sweden | 659 | 661 | 642 | 628 | 584 |
| Switzerland | 534 | 529 | 547 | 375 | 375 |
| United Kingdom | 11,050 | 10,975 | 10,886 | 10,938 | 9,900 |
| Yugoslavia | 22 | 19 | 20 | 19 | 21 |
| Total [e] [2] | 41,700 | 40,600 | 41,000 | 40,600 | 39,000 |
| Asia: | | | | | |
| Ceylon [e] | 13 | 13 | 11 | 9 | 6 |
| Hong Kong [3] | 20 | 10 | 19 | 17 | 14 |
| India: | | | | | |
| Gashouse | 141 | 140 | 138 | e130 | e75 |
| Low-temperature | 2,002 | 1,989 | 2,313 | 2,525 | 2,436 |
| Japan: | | | | | |
| Gashouse | 4,101 | 4,185 | 3,807 | 3,719 | 4,102 |
| Low-temperature [e] | 83 | 83 | 83 | 83 | 77 |
| Malaya [e] | 22 | 22 | 22 | 22 | 22 |
| Taiwan [e] | 212 | 206 | 254 | 257 | 271 |
| Turkey: | | | | | |
| Gashouse | 110 | 133 | 168 | 186 | 191 |
| Low-temperature | 93 | 91 | 93 | 87 | 87 |
| Total [e] [2] | 7,300 | 7,315 | 7,350 | 7,475 | 7,720 |

See footnotes at end of table.

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TABLE 23.—World production of gashouse, low-, and medium-temperature coke (excluding breeze), by country [1]—Continued

| Country [2] | 1960 | 1961 | 1962 | 1963 | 1964 [p] |
|---|---|---|---|---|---|
| Africa: | | | | | |
| Algeria | 103 | 68 | 77 | 66 | [e] 45 |
| South Africa, Republic of | 67 | 111 | 122 | 139 | 148 |
| United Arab Republic (Egypt) [e] | 33 | 33 | 39 | 39 | 39 |
| Total | 203 | 212 | 238 | 244 | 232 |
| Oceania: | | | | | |
| Australia [7] | 850 | 856 | 853 | 778 | [e] 785 |
| New Zealand [8] | 80 | 86 | 97 | 86 | 88 |
| Total | 930 | 942 | 950 | 864 | 873 |
| World total [3] | 50,840 | 49,700 | 50,310 | 49,960 | 48,630 |

[e] Estimate. [p] Preliminary. W Withheld to avoid disclosing individual company data.
[1] Gashouse coke unless otherwise specified. Includes revisions of data published previously. Data do not add to totals shown, owing to rounding.
[2] Production data for China, Mexico, Rumania, and the U.S.S.R. not available; estimates included in the totals. A negligible amount is produced in Canada.
[3] Includes high-temperature coke.
[4] 1963 data.
[5] Includes breeze.
[6] Includes other cokes.
[7] Year ended June 30 of year stated.
[8] Year ended March 31 of year following that stated.

## COKE OVENS

### SLOT OVENS

A slight gain in the number of slot ovens occurred in 1964 as a result of the completion of 165 new ovens at three furnace-coke plants. A total of 112 ovens was abandoned at three furnace plants, and at year's end there were 14,639 slot ovens at 66 plants compared with 14,586 for the same number of plants in 1963. For the second consecutive year, there was comparatively little construction work in the oven-coke industry. Two possible reasons for this were the reduced operating rates during the early 1960's, which extended the useful life of some of the older batteries, and improvements in the fuel efficiency of blast furnaces, which reduced blast-furnace coke requirements and the need for additional coke capacity.

The durability of slot ovens is indicated by the fact that more than one-fifth of the ovens were over 35 years old at the end of 1964. The majority of these ovens, however, were Semet-Solvay ovens whose construction was quite different from ovens built in recent years. These old ovens, which were built on 5-foot centers, are essentially individual units that have withstood the stresses of continuous service. Most of the modernization and construction of new ovens in recent years has been at furnace plants. Consequently, nearly 69 percent of the ovens in existence at merchant plants were more than 35 years old, whereas the proportion of this age group at furnace plants was 13 percent.

Although many kinds of slot ovens have been built since the first battery of Semet-Solvay ovens in the United States was erected at

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Syracuse, N.Y., in 1893, all but two batteries built in the past two decades have been either Koppers or Wilputte At the end of 1964, 69 percent were Koppers-Becker, including old-type Koppers; 31 percent were Wilputte, including Semet-Solvay; and less than 1 percent were other types.

**TABLE 24.—Slot ovens completed and abandoned in the United States in 1964, by State**

| State | Plants in existence Dec. 31 [1] | Ovens | | | |
|---|---|---|---|---|---|
| | | New | Abandoned during year [2] | In existence Dec. 31 | Under construction Dec. 31 |
| Alabama | 7 | | | 1,516 | |
| California | 1 | | | 315 | |
| Colorado | 1 | | | 206 | |
| Connecticut | 1 | | | 70 | |
| Illinois | 6 | | | 568 | |
| Indiana | 5 | | | 2,218 | |
| Kentucky | 1 | | | 196 | |
| Maryland | 1 | | | 757 | |
| Michigan | 4 | 45 | | 778 | |
| Minnesota | 2 | | | 180 | |
| Missouri | 1 | | | 58 | |
| New Jersey | 1 | | | 120 | |
| New York | 3 | 50 | | 855 | |
| Ohio | 12 | 70 | 54 | 1,836 | |
| Pennsylvania | 12 | | 58 | 3,662 | |
| Tennessee | 1 | | | 44 | |
| Texas | 2 | | | 140 | |
| Utah | 1 | | | 252 | |
| West Virginia | 3 | | | 668 | |
| Wisconsin | 1 | | | 200 | |
| Total 1964 | 66 | 165 | 112 | 14,639 | |
| At merchant plants | 17 | | | 1,894 | |
| At furnace plants | 49 | 165 | 112 | 12,745 | |
| Total 1963 | 66 | 86 | 61 | 14,586 | 50 |

[1] Excludes plants retired permanently during year.
[2] Includes ovens dismantled for rebuilding.

**TABLE 25.—Number of slot ovens in the United States on Dec. 31, 1964, by State and kind**

| State | Koppers | Koppers-Becker | Semet-Solvay | Wilputte | All others | Total |
|---|---|---|---|---|---|---|
| Alabama | 510 | 633 | 180 | 130 | [1] 63 | 1,516 |
| California | | 315 | | | | 315 |
| Colorado | 60 | 146 | | | | 206 |
| Connecticut | | 70 | | | | 70 |
| Illinois | | 238 | | 330 | | 568 |
| Indiana | 340 | 1,166 | 60 | 652 | | 2,218 |
| Kentucky | | | 120 | 76 | | 196 |
| Maryland | | 757 | | | | 757 |
| Michigan | | 268 | 362 | 148 | | 778 |
| Minnesota | 65 | 115 | | | | 180 |
| Missouri | 18 | | | | [2] 40 | 58 |
| New Jersey | 55 | 65 | | | | 120 |
| New York | 135 | 236 | 120 | 364 | | 855 |
| Ohio | 667 | 586 | 122 | 461 | | 1,836 |
| Pennsylvania | 903 | 1,546 | 88 | 1,125 | | 3,662 |
| Tennessee | | | 24 | 20 | | 44 |
| Texas | | 140 | | | | 140 |
| Utah | | 252 | | | | 252 |
| West Virginia | 154 | 514 | | | | 668 |
| Wisconsin | 100 | | 100 | | | 200 |
| Total 1964 | 3,007 | 7,047 | 1,176 | 3,306 | 103 | 14,639 |
| At merchant plants | 398 | 469 | 624 | 363 | 40 | 1,894 |
| At furnace plants | 2,609 | 6,578 | 552 | 2,943 | 63 | 12,745 |
| Total 1963 | 3,065 | 6,882 | 1,230 | 3,306 | 103 | 14,586 |

[1] Otto. [2] Simon-Carves.

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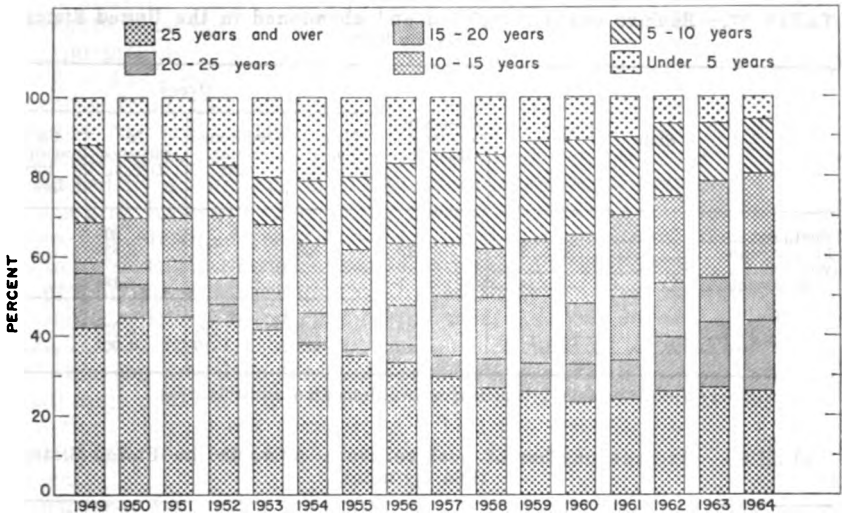


FIGURE 5.—Age of slot ovens in the United States.

TABLE 26.—Age of slot ovens in the United States on Dec. 31 1964 [1]

| Age | At merchant plants | | At furnace plants | | Total | |
|---|---|---|---|---|---|---|
| | Number of ovens | Percent of total | Number of ovens | Percent of total | Number of ovens | Percent of total |
| Under 5 years | 78 | 4.1 | 798 | 6.3 | 876 | 6.0 |
| From 5 to 10 years | | | 1,980 | 15.5 | 1,980 | 13.5 |
| From 10 to 15 years | 214 | 11.3 | 3,309 | 25.9 | 3,523 | 24.1 |
| From 15 to 20 years | 55 | 2.9 | 1,856 | 14.6 | 1,911 | 13.0 |
| From 20 to 25 years | 216 | 11.4 | 2,342 | 18.4 | 2,558 | 17.5 |
| From 25 to 30 years | 35 | 1.9 | 792 | 6.2 | 827 | 5.7 |
| From 30 to 35 years | | | | | | |
| From 35 to 40 years | 387 | 20.4 | 111 | .9 | 498 | 3.4 |
| 40 years and over | 909 | 48.0 | 1,557 | 12.2 | 2,466 | 16.8 |
| Total | 1,894 | 100.0 | 12,745 | 100.0 | 14,639 | 100.0 |

[1] Age dates from first entry into operation or from last date of rebuilding.

## BEEHIVE OVENS

Table 27 shows the number of plants and beehive-coke ovens in existence at the close of 1964 as reported by the owners or operators. This figure, however, does not represent the total number of ovens capable of producing coke. Ovens reported abandoned and plants closed have been removed from the list of active ovens. Many of these ovens could be reactivated with a minimum of repairs if there were a demand for metallurgical coke, and if coking coal were available.

The increase demand for metallurgical coke in 1964 resulted in the reactivation of several beehive plants that had been idle for several years, and the average number of beehive ovens active at the end of the year was nearly double the number active in January. The sharp increase in demand for beehive coke in the latter months of 1964 is evident in table 28 which shows the average number of ovens active in each month.

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**TABLE 27.—Beehive ovens completed and abandoned in the United States in 1964, by State**

| State | Plants in existence Dec. 31 | Ovens | | | |
|---|---|---|---|---|---|
| | | New or rebuilt | Abandoned during year | In existence Dec. 31 | Under construction Dec. 31 |
| Kentucky | 1 | | | 200 | |
| Pennsylvania | 18 | 300 | 136 | 3,800 | |
| Virginia | 6 | | | 877 | |
| West Virginia | 1 | | | 194 | |
| Total: | | | | | |
| 1964 | 26 | 300 | [1] 136 | 5,071 | |
| 1963 | 26 | 318 | [1] 390 | 4,907 | |

[1] Idle and not expected to resume production; removed from list of available ovens.

**TABLE 28.—Average number of beehive ovens active in the United States in 1964, by month**

| Month | Number | Month | Number | Month | Number |
|---|---|---|---|---|---|
| January | 1,439 | May | 1,608 | September | 2,054 |
| February | 1,605 | June | 1,609 | October | 2,259 |
| March | 1,581 | July | 1,634 | November | 2,674 |
| April | 1,822 | August | 1,665 | December | 2,795 |

## COKING COAL

### QUANTITY AND VALUE OF COAL CARBONIZED

Coke ovens carbonized about one-sixth of the bituminous coal produced in 1964 and ranked second to electric utilities in the utilization of coal. Generally, a uniform rate of coal is charged into coke ovens, particularly in slot ovens, because of the continuous operation of the coking process. In 1964, however, the rate of utilization at both oven and beehive plants increased sharply in the latter months of the year. This development resulted in a gain of 14 percent in the quantity of bituminous coal charged into slot ovens, and 26 percent for beehive ovens. The blending of small proportions of anthracite fines with bituminous coal, mainly by producers of foundry coke, resulted in the utilization of nearly 500,000 tons of anthracite fines in the coke industry in 1964.

Coal costs at oven-coke plants continued to decline in 1964, although costs at beehive plants increased slightly. Coal costs are highest at plants farthest from their source of coal, particularly those along the Great Lakes, in the northeast, and on the west coast. Thus, the highest average costs of coal per ton were in California, Colorado, and Utah; in Connecticut, Maryland, New Jersey, and New York; and in Minnesota and Wisconsin. West Virginia oven-coke plant operators had the lowest-cost coal, followed by Alabama, Pennsylvania, and Ohio.

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The delivered cost of coal to coke plants is important because coal represents between 65 and 70 percent of the cost of making coke. Transportation is one of the principal items in delivered coal costs. Many of the coke-producing centers in the United States are great distances from the coalfields, and transportation charges in some instances are greater than mine costs of the coking coal. The effect of transportation fees on delivered costs of coal to coke plants is illustrated by a comparison of the average values of delivered coal in Illinois and Indiana. For many years, all coal carbonized in these States was obtained from the Appalachian region, and the average values for both States were about the same. In recent years, however, the proportion of indigenous coal used in Illinois has increased, and in 1964 comprised 26 percent of the total coal carbonized within the State. As a result, the delivered cost of coal in Illinois averaged $0.79 per ton less than that delivered in Indiana.

Although coal costs in general were lower in 1964 than for the 1957–59 period, there were exceptions. The far western States of California, Colorado, and Utah recorded slight increases in average costs for coal.

Coal costs for beehive-coke plants usually are much lower than for oven-coke plants because the ovens are located at or near their source of supply. Coal costs at beehive plants increased slightly in all producing States.

Table 29 shows the quantity and value of coals of individual States and groups of States.

**TABLE 29.—Quantity and value at ovens of coal carbonized in the United States in 1964, by State**

| State | Coal carbonized | | | Coal per ton of coke | |
|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value |
| | | Total | Average | | |
| Oven coke: | | | | | |
| Alabama | 6,365,139 | $49,341,246 | $7.75 | 1.36 | $10.52 |
| California, Colorado, Utah | 4,687,274 | 59,035,799 | 12.59 | 1.60 | 20.11 |
| Connecticut, Maryland, New Jersey, New York | 11,043,820 | 124,138,653 | 11.24 | 1.44 | 16.15 |
| Illinois | 3,366,792 | 31,092,258 | 9.23 | 1.46 | 13.53 |
| Indiana | 11,742,407 | 117,695,546 | 10.02 | 1.44 | 14.41 |
| Kentucky, Missouri, Tennessee, Texas | 2,897,135 | 27,091,369 | 9.35 | 1.41 | 13.16 |
| Michigan | 5,305,865 | 52,311,516 | 9.86 | 1.36 | 13.39 |
| Minnesota and Wisconsin | 1,205,977 | 12,936,896 | 10.73 | 1.29 | 13.87 |
| Ohio | 10,352,914 | 93,170,046 | 9.00 | 1.43 | 12.86 |
| Pennsylvania | 25,313,522 | 204,726,939 | 8.09 | 1.44 | 11.64 |
| West Virginia | 4,943,634 | 37,882,605 | 7.66 | 1.46 | 11.18 |
| Total 1964 | 87,224,479 | 809,422,873 | 9.28 | 1.43 | 13.29 |
| At merchant plants | 8,822,552 | 87,228,299 | 9.89 | 1.39 | 13.77 |
| At furnace plants | 78,401,927 | 722,194,574 | 9.21 | 1.44 | 13.23 |
| Total 1963 | 76,470,038 | 725,812,979 | 9.49 | 1.43 | 13.62 |
| Beehive coke: | | | | | |
| Pennsylvania | 914,405 | 5,037,357 | 5.51 | 1.63 | 8.97 |
| Kentucky and Virginia | 1,111,010 | 5,729,495 | 5.16 | 1.65 | 8.49 |
| Total: | | | | | |
| 1964 | 2,025,415 | 10,766,852 | 5.32 | 1.64 | 8.71 |
| 1963 | 1,612,581 | 8,287,970 | 5.14 | 1.66 | 8.54 |

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**TABLE 30.—Bituminous coal carbonized in coke ovens in the United States, by month**

(Short tons)

| Month | 1957–59 (average) | | | 1963 | | | 1964 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Slot | Beehive | Total | Slot | Beehive | Total | Slot | Beehive | Total |
| Jan | 7,974,200 | 220,300 | 8,194,500 | 6,028,800 | 109,600 | 6,138,400 | 6,656,800 | 139,600 | 6,796,400 |
| Feb | 7,312,300 | 213,300 | 7,525,600 | 5,637,200 | 111,900 | 5,749,100 | 6,411,800 | 135,300 | 6,547,100 |
| Mar | 8,125,900 | 251,200 | 8,377,100 | 6,603,300 | 110,000 | 6,713,300 | 6,868,100 | 154,100 | 7,022,200 |
| Apr | 7,619,800 | 230,500 | 7,850,300 | 6,762,900 | 144,300 | 6,907,200 | 6,901,100 | 150,900 | 7,052,000 |
| May | 7,833,800 | 198,000 | 8,031,800 | 7,139,100 | 167,800 | 7,306,900 | 7,388,600 | 154,600 | 7,543,200 |
| June | 7,569,600 | 180,700 | 7,750,300 | 6,770,500 | 159,600 | 6,930,100 | 7,221,000 | 133,200 | 7,354,200 |
| July | 6,531,200 | 138,300 | 6,669,500 | 6,398,400 | 142,300 | 6,540,700 | 7,337,000 | 114,500 | 7,451,500 |
| Aug | 5,892,900 | 139,900 | 6,032,800 | 5,975,700 | 134,200 | 6,109,900 | 7,308,000 | 155,500 | 7,463,500 |
| Sept | 5,849,300 | 132,400 | 5,981,700 | 5,905,000 | 133,500 | 6,038,500 | 7,311,000 | 182,300 | 7,493,300 |
| Oct | 6,152,600 | 127,100 | 6,279,700 | 6,232,600 | 139,000 | 6,371,600 | 7,777,200 | 210,000 | 7,987,200 |
| Nov | 7,116,800 | 129,300 | 7,246,100 | 6,107,800 | 128,100 | 6,235,900 | 7,646,200 | 233,200 | 7,879,400 |
| Dec | 7,842,200 | 144,300 | 7,986,500 | 6,458,200 | 132,300 | 6,590,500 | 7,905,400 | 262,200 | 8,167,600 |
| Total | 85,820,600 | 2,105,300 | 87,925,900 | 76,019,500 | 1,612,600 | 77,632,100 | 86,732,200 | 2,025,400 | 88,757,600 |

**TABLE 31.—Anthracite carbonized at oven-coke plants in the United States, by month**

(Short tons)

| Month | 1957–59 (average) | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| January | 29,700 | 25,300 | 35,100 | 37,500 | 42,400 |
| February | 28,200 | 23,100 | 32,100 | 36,300 | 39,100 |
| March | 29,900 | 23,600 | 34,300 | 42,900 | 42,200 |
| April | 29,100 | 25,200 | 34,600 | 35,500 | 41,300 |
| May | 30,200 | 27,000 | 31,500 | 38,900 | 41,300 |
| June | 26,000 | 26,100 | 30,300 | 36,200 | 39,600 |
| July | 24,800 | 25,300 | 30,600 | 34,100 | 42,800 |
| August | 25,600 | 26,000 | 34,600 | 34,400 | 35,300 |
| September | 26,300 | 27,300 | 35,000 | 35,600 | 41,500 |
| October | 29,800 | 28,400 | 39,600 | 39,200 | 43,400 |
| November | 29,000 | 30,700 | 38,700 | 36,200 | 41,700 |
| December | 29,000 | 32,100 | 43,100 | 43,700 | 41,700 |
| Total | 337,600 | 320,100 | 419,500 | 450,500 | 492,300 |

**TABLE 32.—Value of coal and products per short ton of coal carbonized in the United States**

| Year | Oven coke | | | | | Beehive coke | |
|---|---|---|---|---|---|---|---|
| | Value of coal per ton | Value per ton of coal | | | | Value of coal per ton | Value per ton of coal |
| | | Coke produced | Breeze produced | Coal-chemical materials used or sold [1] | Total | | |
| 1957–59 (average) | $9.90 | $12.75 | $0.31 | $3.84 | $16.90 | $6.12 | $8.76 |
| 1961 | 9.79 | 12.45 | .34 | 3.84 | 16.63 | 6.10 | 8.88 |
| 1962 | 9.85 | 12.64 | .32 | 3.61 | 16.57 | 5.31 | 9.07 |
| 1963 | 9.49 | 12.25 | .33 | 3.33 | 15.91 | 5.14 | 9.26 |
| 1964 | 9.28 | 12.43 | .30 | 3.34 | 16.07 | 5.32 | 9.18 |

[1] Includes value of surplus gas used and tar and pitch-of-tar burned.

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**TABLE 33.—Average value per short ton of coal carbonized at oven-coke plants in the United States, by State**

| State | 1957–59 (average) | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Alabama | $8.13 | $8.36 | $8.35 | $8.29 | $7.75 |
| California, Colorado, Utah | 12.24 | 12.92 | 12.58 | 12.86 | 12.59 |
| Connecticut, Maryland, New Jersey, New York | [1] 11.87 | 12.01 | 12.31 | 11.59 | 11.24 |
| Illinois | 10.65 | 9.84 | 9.66 | 9.35 | 9.23 |
| Indiana | 11.23 | 11.20 | 11.22 | 10.60 | 10.02 |
| Kentucky, Missouri, Tennessee, Texas | 10.60 | 8.62 | 9.07 | 9.06 | 9.35 |
| Michigan | 10.22 | 10.14 | 10.05 | 9.87 | 9.86 |
| Minnesota and Wisconsin | 11.46 | 11.07 | 11.13 | 11.02 | 10.73 |
| Ohio | 9.79 | 9.11 | 8.94 | 8.72 | 9.00 |
| Pennsylvania | 8.56 | 8.33 | 8.82 | 8.45 | 8.09 |
| West Virginia | 7.74 | 7.80 | 7.64 | 7.47 | 7.66 |
| Average | 9.90 | 9.79 | 9.85 | 9.49 | 9.28 |
| Value of coal per ton of coke | 14.08 | 14.00 | 14.14 | 13.62 | 13.29 |

[1] Includes Massachusetts.

## PREPARATION OF COKING COAL

### WASHED AND UNWASHED

One of the first steps in preparing coals for coking is mechanical cleaning by pneumatic or wet methods. The method generally used involves a wet process using jigs, concentrating tables, classifiers, launder washers, dense-medium processes, flotation, and other techniques. For this reason, all of the cleaned coal used in the coke industry is classified as washed.

Approximately 95 percent of the coal charged into slot ovens and 89 percent of that going into beehive ovens in 1964 was washed. The steady increase in the proportion of cleaned coal carbonized in recent years was due largely to the mechanization of mining operations. Mechanical mining and loading of coal, although increasing productivity and reducing mining costs, often results in more refuse in the run-of-mine coal, and in some areas necessitates extensive cleaning. All of the bituminous coal mined in Alabama, Colorado, and Utah used in coke ovens was washed before carbonization. Roughly 99 percent of the West Virginia, Pennsylvania, and eastern Kentucky coals was washed. The bulk of the unwashed coals carbonized was high quality coals that originated mainly in Pennsylvania and West Virginia.

Detailed data on the use of washed coals are shown in table 34. Trends in the use of washed coals are indicated in table 35.

### BLENDING

The judicious blending of coking coals is standard operating practice at oven-coke plants. Coal cleaning maintains the uniformity of quality of an individual coal; blending maintains the uniformity of the coking-coal admixtures. The principal objectives of blending coals are as follows: (1) To improve the chemical and physical quality and uniformity of the coke; (2) to control the pressure developed in the oven by the carbonization process; (3) to regulate the yield of products; and (4) to broaden the use of inferior coals. Coke plants generally have four or more mixing or blending bins, depending on the number of different coals blended. The usual practice is to blend major pro-

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**TABLE 34.—Washed and unwashed coal carbonized in the United States in 1964, by State in which used**

(Short tons)

| State | Bituminous coal | | | Anthracite | Grand total |
|---|---|---|---|---|---|
| | Washed | Unwashed | Total | | |
| Oven coke: | | | | | |
| Alabama | 6,280,119 | 46,410 | 6,326,529 | 38,610 | 6,365,139 |
| California, Colorado, Utah | 4,499,420 | 187,854 | 4,687,274 | ---------- | 4,687,274 |
| Connecticut, Maryland, New Jersey, New York | 9,443,092 | 1,560,494 | 11,003,586 | 40,234 | 11,043,820 |
| Illinois | 2,997,289 | 359,458 | 3,356,747 | 10,045 | 3,366,792 |
| Indiana | 11,232,807 | 428,483 | 11,661,290 | 81,117 | 11,742,407 |
| Kentucky, Missouri, Tennessee, Texas | 2,459,934 | 387,507 | 2,847,441 | 49,694 | 2,897,135 |
| Michigan | 5,201,294 | ---------- | 5,201,294 | 104,571 | 5,305,865 |
| Minnesota and Wisconsin | 1,171,130 | ---------- | 1,171,130 | 34,847 | 1,205,977 |
| Ohio | 9,310,923 | 956,023 | 10,266,946 | 85,968 | 10,352,914 |
| Pennsylvania | 24,903,224 | 363,066 | 25,266,290 | 47,232 | 25,313,522 |
| West Virginia | 4,943,634 | ---------- | 4,943,634 | ---------- | 4,943,634 |
| Total 1964 | 82,442,866 | 4,289,295 | 86,732,161 | 492,318 | 87,224,479 |
| At merchant plants | 8,257,038 | 147,656 | 8,404,694 | 417,858 | 8,822,552 |
| At furnace plants | 74,185,828 | 4,141,639 | 78,327,467 | 74,460 | 78,401,927 |
| Total 1963 | 71,065,392 | 4,954,137 | 76,019,529 | 450,509 | 76,470,038 |
| Beehive coke: | | | | | |
| Pennsylvania | 749,222 | 165,183 | 914,405 | ---------- | 914,405 |
| Kentucky, Virginia, West Virginia | 1,063,328 | 47,682 | 1,111,010 | ---------- | 1,111,010 |
| Total: | | | | | |
| 1964 | 1,812,550 | 212,865 | 2,025,415 | ---------- | 2,025,415 |
| 1963 | 1,423,677 | 188,904 | 1,612,581 | ---------- | 1,612,581 |

**TABLE 35.—Washed and unwashed bituminous coal carbonized in the United States**

(Short tons)

| Year | Washed coal | | | Unwashed coal | | | Total coal carbonized | Percent of total washed |
|---|---|---|---|---|---|---|---|---|
| | In slot ovens | In beehive ovens | Total | In slot ovens | In beehive ovens | Total | | |
| 1957-59 (average) | 66,219,149 | 1,429,859 | 67,649,008 | 19,601,434 | 675,484 | 20,276,918 | 87,925,926 | 76.9 |
| 1961 | 61,700,024 | 1,184,232 | 62,884,256 | 10,685,016 | 311,874 | 10,996,890 | 73,881,146 | 85.1 |
| 1962 | 62,026,666 | 1,124,809 | 63,151,475 | 10,896,661 | 214,053 | 11,110,714 | 74,262,189 | 85.0 |
| 1963 | 71,065,392 | 1,423,677 | 72,489,069 | 4,954,137 | 188,904 | 5,143,041 | 77,632,110 | 93.4 |
| 1964 | 82,442,866 | 1,812,550 | 84,255,416 | 4,289,295 | 212,865 | 4,502,160 | 88,757,576 | 94.9 |

portions of high-volatile coal with minor proportions of low-volatile coal. The addition of low-volatile coal improves the physical structure and increases the yield of the coke. Low-volatile coals usually are highly expanding coals, and the proportion that can be added is limited because of possible damage to oven walls when the coke is being discharged from the ovens. In addition to using high- and low-volatile coals, some plants also use medium-volatile coals or other blending materials such as anthracite or coal-tar pitch. In 1964, 61 of the 64 active coke plants used coals of different volatile contents. Of these, 39 (including 7 blending anthracite) used high- and low-volatile coals; 13 (including 10 blending anthracite) used high-, medium-, and low-volatile coals; 6 plants used high- and medium-volatile coals; 3 plants used medium- and low-volatile coals (including 2 blending anthracite); and 3 plants used medium-volatile coals exclusively.

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Coking-coal admixtures are selected carefully, and coke-plant operators are reluctant to make frequent changes. This is clearly indicated in the data presented in table 36, which shows that the average volatile content of all bituminous coals carbonized in 1964 (30.4) was only 1 percent higher than the average for the 1957-59 period.

The proportions of high-, medium-, and low-volatile coals used by the coke industry have not varied greatly in the past two decades. There are wide variations, however, in the proportions of the different types used at individual plants. This is shown in table 37, which gives the receipts of coal according to volatile content, by State.

The highest proportion of high-volatile coals was used in West Virginia and the Far Western States. Alabama used the highest proportion of medium-volatile coals, and the Lake States of Minnesota and Wisconsin, the highest percent of low-volatile. Merchant oven-coke plants used a greater percentage of low-volatile coal than furnace plants because a large part of their coke is foundry grade, for which larger proportions of low-volatile coals are used in the blends.

**TABLE 36.—Average volatile content of bituminous coal carbonized by oven-coke plants in the United States**

| Year | High | | Medium | | Low | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Short tons | Volatile content (percent) | Short tons | Volatile content (percent) | Short tons | Volatile content (percent) | Short tons | Volatile content (percent) |
| 1957-59 (average) | 56,499,763 | 34.9 | 11,447,103 | 26.0 | 17,873,717 | 17.7 | 85,820,583 | 30.1 |
| 1961 | 47,304,877 | 35.6 | 10,175,333 | 25.9 | 14,904,830 | 17.6 | 72,385,040 | 30.5 |
| 1962 | 47,846,051 | 35.3 | 10,469,256 | 26.1 | 14,608,020 | 17.6 | 72,923,327 | 30.4 |
| 1963 | 49,825,740 | 35.4 | 10,657,200 | 26.1 | 15,536,589 | 17.4 | 76,019,529 | 30.4 |
| 1964 | 58,011,780 | 35.2 | 11,151,584 | 25.9 | 17,568,797 | 17.5 | 86,732,161 | 30.4 |

**TABLE 37.—Coal received by oven-coke plants in the United States in 1964, by consuming State and volatile content [1]**

(Short tons)

| Consuming State | High-volatile | | Medium-volatile | | Low-volatile | | Total coal receipts |
|---|---|---|---|---|---|---|---|
| | Quantity | Percent of total | Quantity | Percent of total | Quantity | Percent of total | |
| Alabama | 539,831 | 8.2 | 5,430,942 | 82.3 | 626,351 | 9.5 | 6,597,124 |
| California, Colorado, Utah | 4,124,349 | 83.1 | 655,923 | 13.2 | 181,649 | 3.7 | 4,961,921 |
| Connecticut, Maryland New Jersey, New York | 8,194,477 | 68.0 | 458,067 | 3.8 | 3,403,379 | 28.2 | 12,055,923 |
| Illinois | 2,553,247 | 74.9 | 46,486 | 1.4 | 809,301 | 23.7 | 3,409,034 |
| Indiana | 6,735,207 | 57.1 | 1,992,734 | 16.9 | 3,060,978 | 26.0 | 11,788,919 |
| Kentucky, Missouri, Tennessee, Texas | 1,817,250 | 62.8 | 436,274 | 15.1 | 640,883 | 22.1 | 2,894,407 |
| Michigan | 3,426,266 | 61.7 | 488,575 | 8.8 | 1,640,765 | 29.5 | 5,555,606 |
| Minnesota and Wisconsin | 640,278 | 44.5 | 139,684 | 9.7 | 658,092 | 45.8 | 1,438,054 |
| Ohio | 7,963,073 | 75.7 | 219,889 | 2.1 | 2,335,780 | 22.2 | 10,518,742 |
| Pennsylvania | 19,090,439 | 73.1 | 1,631,223 | 6.2 | 5,393,868 | 20.7 | 26,115,530 |
| West Virginia | 4,146,355 | 82.9 | 524 | (2) | 854,274 | 17.1 | 5,001,153 |
| Total 1964 | 59,230,772 | 65.6 | 11,500,321 | 12.7 | 19,605,320 | 21.7 | 90,336,413 |
| At merchant plants | 4,486,313 | 48.7 | 1,398,053 | 15.2 | 3,323,302 | 36.1 | 9,207,668 |
| At furnace plants | 54,744,459 | 67.5 | 10,102,268 | 12.4 | 16,282,018 | 20.1 | 81,128,745 |
| Total 1963 | 50,359,603 | 65.3 | 10,796,671 | 14.0 | 15,966,943 | 20.7 | 77,123,217 |

[1] Volatile matter on moisture-free basis: High-volatile—over 31 percent; medium-volatile—22-31 percent; and low-volatile—14-22 percent.
[2] Less than 0.1 percent.

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## SOURCES

Sources of coals carbonized in the United States are shown in table 38. Although bituminous coal was mined in 23 States in 1964, only 10 States shipped coals to coke plants. Of the coals delivered to coke plants, 89 percent originated in Alabama, eastern Kentucky, Pennsylvania, and West Virginia. Only these few States supply the bituminous coals which have the caking or agglomerating properties necessary for use in coke ovens. All bituminous coal deposits of the Appalachian region possess caking or agglomerating properties, but because some coals in certain areas of the region contain high proportions of ash and sulfur, they are not used as mined in making metallurgical coke. Many of these coals, however, can be upgraded to meet established specifications required in the coke industry through conventional cleaning methods. Consequently, the cleaned coals mined in the Appalachian region are distributed widely, as shown in table 39.

In addition to the coking coals of the Applachian region, smaller quantities were obtained from fields in Colorado, Illinois, New Mexico, Oklahoma, Utah, and Virginia.

Coking coals are commonly classified in the United States by volatile content. Volatile matter represents that portion of a coal which is converted into volatile products (gases and vapors) when heated above its decomposition temperature in a coke oven. Three types, classified as high-, medium-, and low-volatile, are used to designate bituminous coals. The limits of volatile-matter content designating each type were established by the American Society for Testing and Materials as follows: High-volatile, over 31 percent; medium-volatile, 22–31 percent; and low-volatile, 14–22 percent.

The better quality high- and medium-volatile coals are found in West Virginia, Pennsylvania, eastern Kentucky, and Alabama. Low-volatile coals (pointed out in the preceding section on Blending) are used for improving the physical properties of metallurgical coke, especially its strength, and are obtained largely from West Virginia and central Pennsylvania. In preceding years, some low-volatile coals have been obtained from western Arkansas, but none was obtained from that State in 1964, and only 585,000 tons was received from eastern Oklahoma.

## CAPTIVE COAL

The oven-coke industry purchases less than 40 percent of its coking-coal requirements and obtains the balance from mines owned by the coke-producing companies. This is known as captive coal and ordinarily does not move in commercial channels, but is mined as needed by the coke-producing companies. By owning the coal mines, coke-plant operators have better control of the quality and supply of coking coals. It is evident from the data in table 40 that the optimum proportions of captive coal desired by the coke-oven operators was reached in the mid-1950's. For example, since the 1957–59 period, the proportion of captive coal obtained by oven-coke operators has varied only 1 percent, and was 63 percent in 1964. These data also show that furnace plants use a greater proportion of captive coal than do merchant plants.

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## STOCKS

Monthend stocks of bituminous coal and anthracite at oven-coke plants are shown in tables 41 and 42. Adequate stocks of coal are extremely important to operators of slot ovens because these ovens are operated continuously and normally cannot be shut down without serious damage to the refractory materials from which they are constructed.

The quantity of bituminous coking coal on hand at all oven-coke plants at the end of 1964 was 26 percent greater than at the end of 1963. The high operating rate of ovens in 1964, however, substantially increased coal requirements and, at the end of the year, there was 39.5 days' supply of coal on hand, compared with 38.5 days' supply available on December 31, 1963. Stocks were maintained at relatively high levels during 1964, ranging from a low of 31.6 days' supply on hand on July 31 to 39.5 days' supply on December 31. The low level of stocks in July was attributed to the annual shutdown of mining operations in the first 2 weeks of the month to allow for miners' vacations.

**TABLE 38.—Origin of coal received by oven-coke plants in the United States in 1964, by producing field and volatile content**

(Short tons)

| State and field [1] where coal was produced | Volatile content [2] | | | Total |
|---|---|---|---|---|
| | High | Medium | Low | |
| Alabama | 432,361 | 5,550,826 | | 5,983,187 |
| Colorado | 1,509,608 | 492,176 | | 2,001,784 |
| Illinois | 1,286,671 | | | 1,286,671 |
| Kentucky: | | | | |
| Elkhorn | 6,502,959 | | | 6,502,959 |
| Harlan | 2,777,460 | | | 2,777,460 |
| Kenova-Thacker | 46,346 | | | 46,346 |
| New Mexico | 380,303 | | | 380,303 |
| Oklahoma | 314,088 | 271,134 | | 585,222 |
| Pennsylvania: | | | | |
| Anthracite | | | 500,597 | 500,597 |
| Bituminous: | | | | |
| Central Pennsylvania | | 324,560 | 2,692,530 | 3,017,090 |
| Connellsville | 5,482,939 | | | 5,482,939 |
| Freeport | 2,427,945 | | | 2,427,945 |
| Pittsburgh | 14,767,669 | | | 14,767,669 |
| Somerset | | | 462,821 | 462,821 |
| Westmoreland | 220,653 | | | 220,653 |
| Utah | 2,234,438 | | | 2,234,438 |
| Virginia: | | | | |
| Buchanan | 275,696 | 548,222 | | 823,918 |
| Pocahontas | | | 309,211 | 309,211 |
| Southwestern | 1,566,464 | 986,307 | | 2,552,771 |
| West Virginia: | | | | |
| Coal River | 572,044 | | | 572,044 |
| Fairmont | 6,762,548 | | | 6,762,548 |
| Kanawha | 5,957,177 | 10,590 | | 5,967,767 |
| Kenova-Thacker | 1,605,555 | | | 1,605,555 |
| Logan | 3,620,882 | 224,960 | | 3,845,842 |
| New River | | | 590,313 | 590,313 |
| Pocahontas | | 1,875,587 | 13,248,291 | 15,123,878 |
| Randolph-Barbour | 64 | | | 64 |
| Tug River | | | 4,214 | 4,214 |
| Webster-Ganley | 486,902 | 1,210,327 | | 1,697,229 |
| Winding Gulf | | 5,632 | 1,797,343 | 1,802,975 |
| Total | 59,230,772 | 11,500,321 | 19,605,320 | 90,336,413 |

[1] As defined by the U.S. Coal Commission of 1922.

[2] Volatile matter on moisture-free basis: High-volatile—over 31 percent; medium-volatile—22-31 percent; and low-volatile—14-22 percent.

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**TABLE 39.—Origin of coal received by oven-coke plants in the United States in 1964, by State**

(Short tons)

| Consuming State | Coal produced in— | | | | | |
|---|---|---|---|---|---|---|
| | Alabama | Colorado | Illinois | Kentucky | New Mexico | Oklahoma |
| Alabama | 5,825,074 | | | | | |
| California, Colorado, Utah | | 2,001,784 | | | 380,303 | 131,198 |
| Connecticut, Maryland, New Jersey, New York | | | | 1,468,007 | | |
| Illinois | | | 892,291 | 1,414,881 | | |
| Indiana | | | 394,380 | 3,733,450 | | |
| Kentucky, Missouri, Tennessee, Texas | 158,113 | | | | | 454,024 |
| Michigan | | | | 1,542,135 | | |
| Minnesota and Wisconsin | | | | 188,453 | | |
| Ohio | | | | 539,171 | | |
| Pennsylvania | | | | 440,668 | | |
| West Virginia | | | | | | |
| Total 1964 | 5,983,187 | 2,001,784 | 1,286,671 | 9,326,765 | 380,303 | 585,222 |
| At merchant plants | 575,881 | | | 46,555 | | |
| At furnace plants | 5,407,306 | 2,001,784 | 1,286,671 | 9,280,210 | 380,303 | 585,222 |
| Total 1963 | 5,131,252 | 1,571,820 | 1,261,939 | 8,326,565 | 279,003 | 658,131 |

| Consuming State | Coal produced in—(Continued) | | | | | Total |
|---|---|---|---|---|---|---|
| | Pennsylvania | Tennessee | Utah | Virginia | West Virginia | |
| Alabama | 37,988 | | | 24,634 | 709,428 | 6,597,124 |
| California, Colorado, Utah | | | 2,234,438 | | 214,198 | 4,961,921 |
| Connecticut, Maryland, New Jersey, New York | 4,023,173 | | | 636,710 | 5,928,033 | 12,055,923 |
| Illinois | 10,134 | | | 46,486 | 1,045,242 | 3,409,034 |
| Indiana | 84,368 | | | 775,512 | 6,801,209 | 11,788,919 |
| Kentucky, Missouri, Tennessee, Texas | 45,001 | | | 99,349 | 2,137,920 | 2,894,407 |
| Michigan | 108,038 | | | 551,344 | 3,354,089 | 5,555,606 |
| Minnesota and Wisconsin | 34,212 | | | 4,742 | 1,210,647 | 1,438,054 |
| Ohio | 4,800,799 | | | 227,409 | 4,951,363 | 10,518,742 |
| Pennsylvania | 14,200,308 | | | 1,217,984 | 10,256,570 | 26,115,530 |
| West Virginia | 3,535,693 | | | 101,730 | 1,363,730 | 5,001,153 |
| Total 1964 | 26,879,714 | | 2,234,438 | 3,085,900 | 37,972,429 | 90,336,413 |
| At merchant plants | 613,627 | | | 840,062 | 7,131,543 | 9,207,668 |
| At furnace plants | 26,266,087 | | 2,234,438 | 2,845,838 | 30,840,886 | 81,128,745 |
| Total 1963 | 21,922,653 | 7,458 | 2,037,384 | 3,371,964 | 32,555,048 | 77,123,217 |

**TABLE 40.—Quantity and percentage of captive coal received by oven-coke plants in the United States**

(Short tons)

| Year | At merchant plants | | | At furnace plants | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total coal received | Captive coal | | Total coal received | Captive coal | | Total coal received | Captive coal | |
| | | Quantity | Percent | | Quantity | Percent | | Quantity | Percent |
| 1957–59 (average) | 10,270,085 | 4,523,385 | 44.0 | 76,660,207 | 48,941,264 | 63.8 | 86,930,292 | 53,464,649 | 61.5 |
| 1961 | 7,727,607 | 3,214,284 | 41.6 | 66,547,998 | 42,354,003 | 63.6 | 74,275,605 | 45,568,287 | 61.4 |
| 1962 | 7,337,664 | 3,361,357 | 45.8 | 65,412,231 | 41,377,978 | 63.3 | 72,749,895 | 44,739,335 | 61.5 |
| 1963 | 8,018,890 | 3,642,257 | 45.4 | 69,104,327 | 43,502,197 | 63.0 | 77,123,217 | 47,144,454 | 61.1 |
| 1964 | 9,207,668 | 3,172,241 | 34.5 | 81,128,745 | 53,265,248 | 65.7 | 90,336,413 | 56,437,489 | 62.5 |

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**TABLE 41.—Monthend stocks of bituminous coal at oven-coke plants in the United States**

(Short tons)

| Month | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| January | 11,428,017 | 10,483,155 | 9,778,578 | 7,338,642 | 7,780,399 |
| February | 11,241,870 | 9,788,567 | 9,407,933 | 7,232,935 | 7,899,711 |
| March | 11,148,141 | 9,551,136 | 9,404,688 | 6,595,093 | 8,298,576 |
| April | 11,324,365 | 9,331,749 | 9,431,344 | 6,883,100 | 8,410,773 |
| May | 11,916,169 | 9,851,556 | 9,668,244 | 7,647,971 | 8,840,881 |
| June | 12,391,359 | 9,932,172 | 10,360,167 | 8,202,228 | 9,375,431 |
| July | 10,342,992 | 8,495,602 | 8,256,863 | 6,386,167 | 7,467,186 |
| August | 10,742,409 | 8,936,261 | 8,276,856 | 6,918,806 | 7,969,248 |
| September | 10,918,346 | 9,135,237 | 8,179,859 | 7,290,283 | 8,643,158 |
| October | 11,082,639 | 9,813,136 | 8,622,170 | 7,911,761 | 9,346,389 |
| November | 11,203,784 | 10,452,933 | 8,849,458 | 8,054,381 | 9,872,705 |
| December | 11,028,816 | 10,392,751 | 8,305,379 | 8,014,046 | 10,081,035 |

**TABLE 42.—Monthend stocks of anthracite at oven-coke plants in the United States**

(Short tons)

| Month | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| January | 77,724 | 74,624 | 85,037 | 99,088 | 82,485 |
| February | 65,831 | 62,092 | 72,282 | 73,173 | 67,204 |
| March | 50,517 | 50,036 | 58,826 | 51,011 | 42,176 |
| April | 55,222 | 51,222 | 51,201 | 44,880 | 36,583 |
| May | 67,100 | 54,241 | 52,181 | 40,473 | 42,782 |
| June | 71,499 | 57,494 | 52,652 | 55,515 | 58,768 |
| July | 68,800 | 58,947 | 61,979 | 58,471 | 60,035 |
| August | 86,143 | 59,811 | 71,150 | 71,982 | 67,531 |
| September | 89,366 | 73,292 | 88,897 | 87,493 | 82,882 |
| October | 108,090 | 98,923 | 101,987 | 110,091 | 103,198 |
| November | 107,542 | 109,281 | 122,315 | 121,476 | 132,546 |
| December | 92,848 | 98,381 | 115,338 | 113,620 | 129,342 |

Anthracite stocks also increased in conjunction with the higher level of oven operations, and were 14 percent higher on December 31, 1964, than at the end of 1963. These stocks are relatively unimportant, however, as only a small portion of anthracite is used in coking-coal admixtures by producers of foundry coke.

## TECHNOLOGY

The increase of productivity and the reduction of production costs, as well as the development of an improved product, are constant factors of concern to the coke industry. Particularly in recent years, great emphasis has been placed on improvement and automation of certain phases of coke-oven operations, and on innovation in operating techniques.

The technique of preheating coal and charging the hot coal into ovens has been studied throughout the world for many years. However, with the foregoing goals in view, this method was the subject of renewed interest in 1964. For several years, considerable work was devoted to the dry charging of coal at the experimental coke plant at Marienau in France by Cherchar. The Federal Bureau of Mines and the Koppers Co., Inc., in the United States also have conducted laboratory experiments and studies on the preheat treatment of coal



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and charging of hot coal. A laboratory study was conducted in Germany on the effect of drying and preheating coking coal. In the Soviet Union, tests on a laboratory scale were conducted at the Moscow Chemical-Technological Institute de Mendeleen.[3] Results of the Soviet tests were in agreement with work done in the previously mentioned countries, and it was found that best results were achieved when coal was heated at a rate of 40° to 70° C per minute. Heating at slower rates (below 10° C per minute) resulted in poorer coking; faster rates (above 90° C per minute) led to an increase in the cracks or fissures. Also, best results in coke structure were found with a final preheat temperature of between 200° and 250° C. At this temperature an increase of 14 to 32 percent was obtained in the bulk density of the charges. The preheating of coal also allowed a more uniform bulk density of the charge throughout oven height. For example, the range of bulk density of a charge containing 3 percent moisture ranged from 690 kg per square meter at the top or surface of the charge, to 832 kg per square meter near the bottom of the oven. For preheated coal, the difference ranged from 860 to 875 kg per square meter from top to bottom of ovens. In addition to increasing bulk density and decreasing coking periods, which increased oven productivity, these tests showed that the structure and properties of coke were improved. The sulfur content of the coal blend and resulting coke decreased as preheating temperatures increased. For example, on unheated coal, all of the sulfur in the coal blend is charged into the oven, and the resulting coke contained 81.6 percent of the original sulfur content. When the same coal was heated to 250° C, only 91.6 percent of the original sulfur remained in the coal blend, and, when carbonized in ovens, only 66.3 percent remained in the coke. Preheating to 350° C resulted in coal blends containing only 74.9 percent of the sulfur while the resulting coke contained only 61.3 The desulfurization of coking coals is important in the U.S.S.R., particularly in the Donets Basin where coking coal has a high sulfur content.

The conclusion drawn from this study was that preheating of coals is an effective method of increasing coke productivity, improving coke structure and properties, and expanding the use of gas and weakly coking coals. Plans were being made to continue tests on a pilot-scale basis. Final conclusion was that if this technique proved technically and economically successful, rising coke requirements can be met with existing capacity.

A series of tests conducted at the Clairton works of the United States Steel Corp. indicate that significant increases in coking rates can be achieved in slot ovens with walls constructed of unusually dense silica brick, or ovens with thinner walls of regular silica brick.[4] Both approaches improve heat transfer rates through the walls, and the coking time for a 21-ton coal charge in each type of oven was reduced from the usual 16.8 hours to as little as 13.9 hours, with net improvements of up to 21 percent in oven productivity. Both types of oven showed a 17-percent shorter coking period for each charge. The dense silica brick used in the experimental ovens were a developmental product of the Harbison-Walker Refractories Co. of Pitts-

[3] Zhitov, B. N., G. N. Makarov, and S. S. Dvorin. The Carbonization of Preheated Coals and Blends. Coke and Chemistry (U.S.S.R.), February 1964, pp. 15–21.
[4] Chemical and Engineering News, v. 42, No. 49, Dec. 7, 1964, pp. 54–56.

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burgh, Pa.; the thin-walled test ovens were designed by the Koppers Co.

A significant development in 1964 was the United States Steel Corp.'s decision to expand chemicals recovery and processing facilities at its Clairton, Pa., coke plant.[5] The main facility will be an anhydrous ammonia plant which will produce ammonia from hydrogen extracted from coke-oven gas. Nitrogen for the synthesis will be supplied by a new conventional air separation plant that will produce high-purity oxygen as a byproduct. Recovery of hydrogen and other chemicals will be effected by a new cryogenic technique that involves condensing the components of coke-oven gas in interchangeable regenerators. A primary regenerator plant will separate a mixture of ethylene and heavier volatile constituents from the gas. Hydrogen sulfide, hydrogen cyanide, and some benzene will be separated from this mixture, leaving a fraction rich in ethylene. Crude hydrogen, about 90 percent pure, will be recovered from the coke-oven gas, leaving the primary regenerator. This hydrogen will be further purified in a liquid nitrogen scrubber before it is combined with nitrogen to produce anhydrous ammonia. It is estimated that this plant will have an annual output of more than 400,000 tons of anhydrous ammonia per year.

In conjunction with the process described above, U.S. Steel will use a new method for removing ammonia from the gas stream.[6] This method, in which ammonia is removed by absorption with a weak solution of ammonium phosphate, will avoid the normally used ammonium sulfate route of ammonia recovery and yield a rich ammonium phosphate solution from which ammonia is recovered by distillation. The process, described in U.S. patent No. 3,024,090, is said to recover up to 99.5 percent of the ammonia in the gas and deliver a clean gas, ready for compression and hydrogen recovery.

Bureau of Mines research on coal carbonization during the year was centered upon developing new processes for carbonizing low-grade coals; perfecting techniques for destroying the agglomerating properties of highly-caking coals in order that these coals may be carbonized, hydrogenized, or gasified in processes employing fixed or fluidized beds; upgrading and characterizing the constituents of low-temperature tars; developing a universally acceptable test for coke quality; and providing information on the carbonizing properties of a number of American coals.

The Bureau continued entrainment carbonization investigations with studies aimed at perfecting the entrainment process for continuously carbonizing coals of any rank, both caking and noncaking, into a nonagglomerating char. To overcome the softening and agglomerating problems associated with the use of coking coals in the previously developed equipment, a 4-inch entrainment carbonization plant with a new coal feed system was designed and constructed. Two exploratory runs using Eagle and Sunnyside coals were made in the new plant late in the year, but no conclusive results were obtained, as neither run had reached a balanced operation.

Three techniques for pretreating highly-caking coals to destroy their agglomerating property were investigated. Such coals become plastic

[5] Chemical and Engineering News, v. 42, No. 40, Oct. 5, 1964, p. 25.
[6] Chemical Week, v. 96, No. 9, Feb. 27, 1965, p. 39.

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and sticky when heated between 570° and 750° F, and cannot be carbonized, hydrogenated, or gassified effectively in fixed or fluidized beds at elevated temperatures. In treatment in a fluidized bed reactor,[7] a nonagglomerating product was obtained when the coal was exposed to mixtures of steam plus oxygen or air at temperatures of 780° to 810° F for 5 to 10 minutes, and, when the coal was exposed to air at 430° to 450° F for 30 to 40 minutes. Caking coals also were converted to noncaking chars when treated under varying temperatures and lengths of time in fixed beds and free-fall reactors.[8]

An electrically heated, experimental, slot-type coke oven with a special coal handling system was constructed for use in a pilot-plant study to investigate the effects of adding char to coking-coal blends. This study will explore the possibility of substituting char for at least part of the relatively expensive low- and medium-volatile coals that are now commonly used in coking-coal blends. Tangible results from this study would be particularly important to western coke-oven operators who now have to use lower-volatile coals that are relatively unavailable in the West.

Methods used to adjust and control the bulk density of coal blends suitable for coking were investigated.[9] Major attention was directed toward the effects of changing surface moisture and particle size, and adding oil, techniques normally used in industry for controlling bulk density. Blends used in this study, which were obtained from a western coke plant, consisted of a Utah high-volatile base coal (Sunnyside, Carbon Co.) and three low- and medium-volatile coals from Oklahoma. Maximum bulk density was obtained with zero surface moisture. As surface moisture was added, bulk density dropped, reaching a minimum at 6 percent before increasing again with further moisture additions. At constant surface moisture, finer grinding of the blend decreased bulk density. Maximum bulk densities from the addition of oil were obtained by using one-half to one gallon of oil per ton of coal. Generally, the addition of oil decreased the bulk density of low-surface-moisture coal and increased that of high-surface-moisture coal.

In an effort to develop a universally acceptable coke quality test, the Bureau undertook a coke testing program to supply data for a direct correlation between the United States Standard ASTM tumbler test and the proposed International Standard Micum tumbler test.[10] Relative strengths of 18 commercially produced cokes were determined by ASTM and Micum tumblers and ASTM shatter test. Statistical procedures were used to relate the three test methods and to evaluate the effect of the charge weights, top sizes of coke, and types of screens specified by the two standard tumbler procedures.

The survey evaluating the coking properties of American coals was continued, and reports were publsihed on coals from Letcher Co., Ky.,[11]

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[7] Forney, A. J., R. F. Kenny, S. J. Gasior, and J. H. Field. Destruction of Caking Properties of Coal by Pretreatment in a Fluidized Bed. Ind. and Eng. Chem., Product Research and Development, v. 3 No. 1, March 1964, pp. 48–53.

[8] Gasior, S. F., A. J. Forney, and J. H. Field. Destruction of the Caking Quality of Bituminous Coal in a Fixed Bed. Ind. and Eng. Chem., Product Research and Development, v. 3, No. 1, March 1964, pp. 43–47.

[9] Landers, W. S., Manuel Gomez, and D. J. Donaven. Bulk Density Studies on a Commercial Blend of Western Coking Coals. BuMines Rept. of Inv. 6502, 1964, 33 pp.

[10] Walters, J. G., G. W. Birge, and D. E. Wolfson. Correlation of ASTM and Micum Test Methods. BuMines Rept. of Inv. 6482, 1964, 48 pp.

[11] Birge, G. W., D. E. Wolfson, and J. H. Lynch, Jr. Carbonizing Properties of Letcher County, Ky., Coals. BuMines Rept. of Inv. 6416, 1964, 16 pp.

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and Buchanan, Dickenson, Russell, Tazewell, and Wise Counties in Virginia.[12] Investigations to determine the coking properties of bituminous coal deposits in northwestern Alaska were continued. These studies provide the metallurgical industries with information on the suitability of various American coals for the manufacture of metallurgical coke.

In a series of tests, the properties of coke produced by the Bureau of Mines in the BM–AGA retort were compared with those of coke produced in commercial ovens.[13] Fifteen of the industrial coke samples were produced in slot ovens, of which 13 were for blast furnace use and 2 were for foundry use; 2 samples were produced in beehive ovens. Although the plastic properties of the coal bends determined by the Giesler, Audibert-Arnu, and Hoffman methods were not correlatable with either the volatile matter of the coal blends or the physical properties of the resultant cokes, a high degree of correlation was obtained between the strength indexes of the pilot-plant and industrial cokes. The apparent gravity of industrial cokes, however, was consistently higher than that of BM–AGA cokes. The study also confirmed previous findings which show that the ash and sulfur content of cokes can be calculated with a high degree of accuracy from the chemical analysis of the coal and the yield of coke.

The Bureau conducted more than 90 carbonization assays on coals in 1964. This test, which is useful for predicting char, tar, and light-oil yields from larger equipment, is used also to provide data to guide the direction of research programs. Fifty-four of the assays were made in conjuction with a study on the effect of storage on carbonization yields.

Work on the characterization of low-temperature tars was continued, and a revised analytical procedure for identifying the constituents of various tars was developed. The procedure, which combines distillation, extraction, and chromatograph techniques, can be performed on standard laboratory equipment by technicians with limited laboratory experience. The procedure gives relatively detailed information on coal-tar constituents of greatest interest in product identification and processing.

The Bureau expanded its studies on the composition of various low-temperature tars to include tars produced by fixed-bed (BM–AGA), fluidized-bed, and entrainment-bed carbonizers. Emphasis was placed on determining the yields of compounds of current commercial interest. Comparisons made of tars produced in each type of carbonizer from Eagle subbituminous coal carbonized at 500° C showed that yields of commercially valuable oils were much higher from the BM–AGA process than from the other two.

The changes that occur in low-temperature tar vapors when they are thermally cracked in a high-temperature, fluidized-coke bed were studied also. This investigation showed that at 600° C the yield of paraffins, acids, aromatics, and olefins in the distillate increased with an increase in the tar vapor concentration in the cracker, but at higher temperatures, only the acids and aromatics increased with increased

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[12] Birge, G. W., D. E. Wolfson, and J. H. Lynch, Jr. Carbonizing Properties of Coals from Buchanan, Dickenson, Russell, Tazewell, and Wise Counties, Va. BuMines Rept. of Inv. 6355, 1964, 22 pp.

[13] Wolfson, D.E., G. W. Birge, and J. G. Walters. Comparison of Properties of Coke Produced by BM-AGA and Industrial Methods. BuMines Rept. of Inv. 6354, 1964, 19 pp.

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concentration. At 800° C most of the paraffins, naphthenes, and olefins decomposed, while the yield of tar bases remained essentially unchanged by cracking.

Research was continued on several projects directed at converting low-temperature tar into marketable products. Pitch obtained from low-temperature lignite tar was heated and blown with air or oxygen in an attempt to modify it for use as an electrode binder. Although this treatment increased the softening point and carbon-hydrogen ratio of the pitch, both important properties of electrode binder pitch, the values obtained were not comparable with those of commercial bituminous coal-tar pitch.

Yields of carbonization products as affected by coal storage time and conditions were studied under a cooperative agreement between between the Bureau of Mines and the Union Carbide Olefins Co. In this investigation, in which coal was stored under varying conditions of particle size, pile size, and storage time, it was found that yields of tar and light oil were fairly sensitive to short periods of storage, with the effects perceptible after three days and continuing to increase for at least seven weeks. However, the overall effect diminished as pile size was increased.

## COAL CHEMICALS

### GENERAL REVIEW

Four basic coal-chemical materials—tar, ammonia, light oil, and gas—are recovered at oven-coke plants from the high-temperature carbonization of coal in slot ovens. Except for ammonia (recovered as an aqueous solution or converted to a salt and sold as produced) these materials are, in most instances, further processed to yield a number of primary chemicals of which the most important are benzene, toluene, xylene, solvent naphtha, naphthalene, crude chemical oil, creosote oil, pitch, and pyridine. Yields of the basic, as well as of the primary chemicals, vary somewhat according to the kind of coals carbonized, operating techniques, and recovery equipment used, but of the products resulting from carbonization, approximately 16 percent (on a weight basis) is recovered as gas and 5 percent as tar, while light oil and ammonia each comprise about 1 percent of the total. In standard units of measure, there were 10,372 cubic feet of gas, 8.75 gallons of tar, 2.92 gallons of light oil, and 18.49 pounds of ammonia (in terms of sulfate equivalent) produced for each ton of coal carbonized in slot ovens in 1964. Table 43 shows production and sales of coal-chemical materials and derivatives at oven-coke plants in 1964.

Figure 6 shows the relative yields of coke and basic coal-chemical materials since 1930. Although yields have varied only slightly from year to year, the figure illustrates that more gas and chemicals were recovered in periods of low industrial activity when there was less de-

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mand for coke. This situation prevailed during the 1930's, when operating rates of ovens were low and coking cycles were longer than normal to provide for the maximum recovery of gas and chemicals which were in demand and readily marketable at that time. Yields fell substantially during the World War II period, when producers operated ovens for maximum coke recovery, and, after the war, changes in the supply and demand patterns of coke, gas, and chemicals kept yields below the levels attained in the 1930's. In recent years, yields have varied somewhat because of changes in coal mixes and other factors, but they have not changed appreciably in the past two decades and, in fact, were not much different in 1964 than in the 1920's.

Table 44 shows the heating value and coal equivalent of products other than coke produced at oven-coke plants. Although the quantities vary from year to year, most of the changes were due to differences in the amount of coal carbonized, rather than large fluctuations in yields. In terms of coal equivalent, the products recovered in 1964 were roughly equal to one-fourth of the coal carbonized in slot ovens.

Figure 7, which depicts the relative value of all products recovered from slot ovens, shows that the proportion of the total value supplied by surplus gas and chemical materials has declined steadily since 1930. Most of the decline in surplus coke-oven gas revenues was due to the introduction of natural gas in the residential and industrial heating markets. The reduction in the value of chemicals was largely the result of competition from petrochemicals which in recent years has become increasingly keen because of the development of new methods for producing high-purity, lower-cost products from natural gas and petroleum.

Table 45 shows the average value of coal-chemical materials recovered (used or sold) from each ton of coal carbonized. Compared with 1957–59, both chemicals and gas have declined in value. Most of the decrease, however, was caused by lower returns from the sale of chemicals which declined 19 percent in value since 1957–59. The decrease in the value of chemicals was due principally to sharp reductions in the prices of light-oil derivatives, particularly benzene which represents about three-fourths of the total dollar value of all light-oil products sold, and which has declined in value about $0.10 per gallon since 1957–59. Surplus gas, which currently represents 45 percent of the total dollar value of chemical materials recovered, declined 5 percent in value during this period, and tar and ammonia products declined 13 percent and 10 percent, respectively.

Table 46 shows the proportions of the cost of coals carbonized that were recovered from the sale of various coal-chemical materials in recent years. Although the proportion recovered has decreased for all materials since 1957–59, the recovery of these products continues to be a major part of coke-plant operations, returning to coke producers in 1964 revenues equivalent to 36 percent of the value of the coals carbonized.

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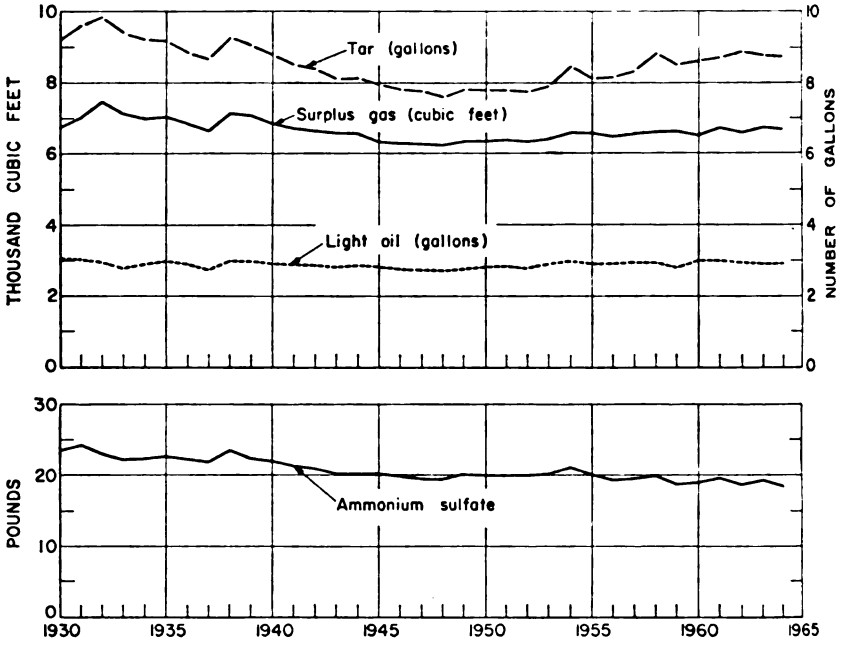


FIGURE 6.—Average yield of principal coal-chemical materials per short ton of coal carbonized in slot ovens in the United States. Yields of light oil and ammonium sulfate equivalent represent average for plants recovering these products.

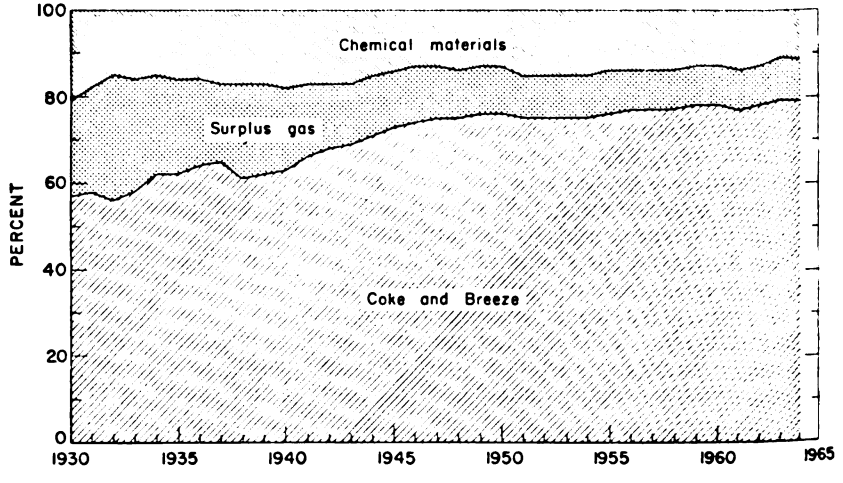


FIGURE 7.—Percentage of total value of coke-oven products from slot ovens supplied by coke and breeze, surplus gas, and chemical materials in the United States.

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**TABLE 43.—Coal-chemical materials, exclusive of breeze, produced at oven-coke plants in the United States in 1964 [1]**

| Product | Produced | Sold | | | On hand Dec. 31 |
|---|---|---|---|---|---|
| | | Quantity | Value | | |
| | | | Total | Average | |
| Tar, crude—gallons | 762,917,505 | [2] 336,084,256 | $34,482,791 | $0.103 | 39,623,992 |
| Tar derivatives: | | | | | |
| Sodium phenolate or carbolate—do | 3,236,282 | [3] 3,277,166 | 352,823 | .108 | 189,755 |
| Crude chemical oil (tar acid oil)—do | 24,892,867 | 24,144,588 | 3,748,738 | .155 | 1,601,117 |
| Pitch-of-tar: [4] | | | | | |
| Soft—short tons | 583,230 | 127,564 | 4,113,245 | 32.245 | 27,726 |
| Hard—do | 503,281 | [3] 217,174 | 7,649,593 | 35.223 | 60,478 |
| Other tar derivatives [5] | | | 11,120,839 | | |
| Ammonia products: | | | | | |
| Sulfate—short tons | 680,887 | [3] 635,633 | 17,967,085 | 28.266 | 158,573 |
| Liquor ($NH_3$ content)—do | 16,202 | 14,923 | 1,048,499 | 70.261 | 1,854 |
| Diammonium and monoammonium phosphate—do | 50,175 | [3] 50,291 | 4,966,574 | 98.757 | 6,460 |
| Total | | | 23,982,158 | | |
| Sulfate equivalent of all forms—short tons | 793,908 | 743,810 | | | 172,225 |
| $NH_3$ equivalent of all forms—do | 204,670 | 191,754 | | | 44,400 |
| Gas: | | | | | |
| Used under boilers, etc.—thousand cubic feet | [6] 904,697,479 | 74,488,904 | 13,445,251 | .181 | |
| Used in steel or allied plants—do | | 460,270,046 | 105,179,613 | .229 | |
| Distributed through city mains—do | | 21,892,599 | 9,287,932 | .424 | |
| Sold for industrial use—do | | 25,495,763 | 4,354,668 | .171 | |
| Total—do | 904,697,479 | 582,147,312 | 132,267,464 | .227 | |
| Crude light oil—gallons | [7] 248,668,967 | 53,702,264 | 6,709,092 | .125 | 7,184,348 |
| Light oil derivatives: | | | | | |
| Benzene: | | | | | |
| Specification grades (excluding Motor grade)—do | 118,944,204 | 119,070,201 | 25,262,753 | .212 | 9,307,528 |
| Motor grade—do | 863,875 | 863,875 | 197,077 | .228 | 9,280 |
| Toluene (all grades)—do | 25,520,509 | 25,529,772 | 4,728,900 | .185 | 2,158,349 |
| Xylene (all grades)—do | 7,119,398 | [3] 7,135,350 | 1,616,517 | .227 | 674,460 |
| Solvent naphtha (crude and refined)—do | 4,483,899 | 4,192,686 | 838,583 | .200 | 484,979 |
| Other light oil derivatives—do | 8,237,221 | 4,853,486 | 426,443 | .088 | 295,551 |
| Total—do | 165,169,106 | 161,645,370 | 33,070,273 | .205 | 12,930,147 |
| Intermediate light oil—do | 5,391,899 | 2,184,839 | 224,260 | .103 | 281,829 |
| Grand total | | | 257,721,276 | | |

[1] Includes products of tar distillation conducted by coke-oven operators under same corporate name.
[2] Includes 31,936,362 gallons sold to affiliated companies for refining and a small amount exported.
[3] Includes small amount exported.
[4] Soft—water-softening point less than 110° F; medium—from 110° to 160° F; hard—over 160° F. Figures on hard pitch include small amount of medium pitch.
[5] Creosote oil, cresols, cresylic acid, naphthalene, phenol, pyridine, refined tar, tar paint.
[6] Includes gas used for heating ovens and gas wasted.
[7] 192,231,020 gallons refined by coke-oven operators to make derived products shown.

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**TABLE 44.—Coal equivalent of the thermal materials except coke, produced at oven-coke plants in the United States**

| Year | Materials produced | | | | Estimated equivalent in heating value [1] (billion Btu) | | | | | Coal equivalent (thousand short tons) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Coke breeze (thousand short tons) | Surplus gas (billion cubic feet) | Tar (thousand gallons) | Light oil (thousand gallons) | Coke breeze | Surplus gas | Tar | Light oil | Total | |
| 1913 | 735 | 64 | 115,145 | 3,000 | 14,700 | 35,200 | 17,272 | 390 | 67,562 | 2,600 |
| 1918 | 1,999 | 158 | 263,299 | 87,562 | 39,980 | 86,900 | 39,495 | 11,383 | 177,758 | 6,785 |
| 1929 | 4,853 | 508 | 680,864 | 200,594 | 97,060 | 279,400 | 102,130 | 26,077 | 504,667 | 19,262 |
| 1939 | 3,354 | 434 | 554,406 | 170,963 | 67,080 | 238,700 | 83,161 | 22,225 | 411,166 | 15,693 |
| 1949 | 4,929 | 546 | 672,407 | 228,754 | 98,580 | 300,300 | 100,861 | 29,738 | 529,479 | 20,209 |
| 1957–59 (average) | 4,077 | 568 | 732,173 | 244,118 | 81,532 | 312,400 | 109,826 | 31,735 | 535,493 | 20,439 |
| 1961 | 3,337 | 490 | 633,378 | 214,003 | 66,740 | 269,500 | 95,007 | 27,820 | 459,067 | 17,522 |
| 1962 | 3,425 | 484 | 650,112 | 211,688 | 68,500 | 266,200 | 97,517 | 27,519 | 459,736 | 17,547 |
| 1963 | 3,609 | 516 | 671,876 | 218,166 | 72,180 | 283,800 | 100,781 | 28,362 | 485,123 | 18,516 |
| 1964 | 3,902 | 582 | 762,918 | 248,669 | 78,040 | 320,100 | 114,438 | 32,327 | 544,905 | 20,798 |

[1] Breeze, 10,000 Btu per pound; gas, 550 Btu per cubic foot; tar, 150,000 Btu per gallon; and light oil, 130,000 Btu per gallon.

**TABLE 45.—Average value of coal-chemical materials used or sold and of coke and breeze produced per short ton of coal carbonized in the United States**

| Product | 1957–59 (average) | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Ammonia products | $0.307 | $0.317 | $0.286 | $0.270 | $0.275 |
| Light oil and its derivatives | .687 | .661 | .545 | .473 | .459 |
| Surplus gas used or sold | 1.592 | 1.572 | 1.527 | 1.526 | 1.516 |
| Tar and its derivatives (including naphthalene): | | | | | |
| Tar burned by producers [1] | .427 | .328 | .404 | .336 | .381 |
| Sold | .828 | .964 | .848 | .719 | .705 |
| Total | 3.841 | 3.842 | 3.610 | 3.324 | 3.336 |
| Coke produced | 12.749 | 12.447 | 12.640 | 12.253 | 12.426 |
| Breeze produced | .308 | .345 | .324 | .328 | .303 |
| Grand total | 16.898 | 16.634 | 16.574 | 15.905 | 16.065 |

[1] Includes pitch-of-tar.

**TABLE 46.—Percentage of coal costs recovered from the sale of coal-chemical materials in the United States**

| | 1957–59 (average) | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Product: | | | | | |
| Ammonia products | 3.1 | 3.2 | 2.9 | 2.8 | 3.0 |
| Light oil and its derivatives | 6.9 | 6.7 | 5.5 | 5.0 | 4.9 |
| Surplus gas used or sold | 16.1 | 16.1 | 15.5 | 16.1 | 16.3 |
| Tar and its derivatives used or sold (including naphthalene) | 12.7 | 13.2 | 12.7 | 11.1 | 11.7 |
| Total | 38.8 | 39.2 | 36.6 | 35.0 | 35.9 |
| Value of coal per short ton | $9.90 | $9.79 | $9.85 | $9.49 | $9.28 |

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### COKE-OVEN GAS

The term "coke-oven gas" normally refers to the gas that remains after tar, ammonia, and light oil have been removed from the volatile matter evolved in carbonization. This gas, composed principally of hydrogen and methane, has a relatively high calorific value, and is used as fuel by producers and sold for residential and industrial heating. A few operations further process coke-oven gas and recover hydrogen, which is combined with nitrogen to form synthetic ammonia.

Yields of gas vary, but the quantity of gas produced for each ton of coal carbonized at high temperatures in slot ovens generally ranges between 9,300 and 11,000 cubic feet, with an overall average in the United States of about 10,500 cubic feet. This is a recovery rate of from 14 to 16 percent, by weight, of the coals carbonized. The overall yield in 1964 was 10,372 cubic feet, slightly less than the yield in 1963, owing to the increased rate of operation of ovens. Total gas production increased 13 percent over output in 1963, however, because of the increased amount of coal carbonized.

Tables 47 and 48 show production, disposal according to use, and the distribution of coke-oven gas in 1964. Roughly, one-third of the production was used for heating coke ovens, and the remainder (surplus gas) was used by producers for firing boilers, transferred to steel or allied plants for heating open-hearth and other metallurgical furnaces, and sold for industrial use or distributed through city mains for residential heating and cooking. A small part of the production was wasted because storage facilities at most plants are limited, and some gas was burned in the atmosphere when production exceeded demand.

Table 48 shows also the disposal of surplus gas by furnace and merchant plants. The bulk of the surplus gas produced at furnace plants in 1964 was consumed by producing companies, particularly in steel or allied plants, and only 4 percent of the total was sold. Merchant plants, generally with no affiliated companies to use the excess gas, sold the bulk of their surplus, which was distributed about equally to city mains and industrial plants. This is about the same disposal pattern that has prevailed at both furnace and merchant plants for the past several years, but there has been a significant change over the past few decades in the percentages of surplus gas used by producers and sold, particularly by furnace plants. Whereas furnace plants during the 1930's and 1940's sold a relatively large percentage of their surplus coke-oven gas (15 percent in 1944) to utilities and industrial plants, these plants now consume the major part as fuel because these outlets have been virtually lost to natural gas. Merchant plants continue to market the major part of their production, but the decline in the use of coke-oven gas for residential and industrial heating caused many plants to suspend operations, and the quantity of gas sold by merchant plants in 1964 was only about one-fifth as large as in 1944.

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Most slot ovens were heated with coke-oven gas, but some operations used blast-furnace gas, a mixture of coke-oven and blast-furnace gas, or natural gas, for underfiring. Table 49 shows the quantities of the various gases used for heating ovens in 1964. Of the 377 billion cubic feet (coke-oven gas equivalent) consumed, 83 percent was coke-oven gas, 16 percent was blast-furnace gas, and the remainder was natural gas.

The total value of surplus coke-oven gas used or sold in 1964 totaled $132 million, a 13-percent increase over that of 1963. The increase is attributed to the larger amount of surplus gas used or sold, as the average unit value of this gas remained at virtually the same level.

## COKE-OVEN AMMONIA

The nitrogen released from coal during high-temperature carbonization is recovered through subsequent processing as ammonia liquor or as a crystallized solid. Ammonia liquor is a weak solution of ammonia (approximately 7 grams per liter of solution), while the solid forms are ammonium sulfate, diammonium phosphate, and monoammonium phosphate.

The recovery of ammonia is a necessary part of oven-plant operations, because some of the ammonia salts not only would corrode the processing equipment, but also contaminate the aromatic hydrocarbons, such as benzene.

Most plants produce ammonium sulfate, and 86 percent of the 204,670 tons of ammonia (equivalent of all forms) produced in 1964 was reacted with sulfuric acid to produce 680,887 tons of this ammonium salt. Eight percent of the ammonia production was recovered as ammonia liquor, and the remainder was reacted with phosphoric acid to produce 50,175 tons of di- and monoammonium phosphate. Of the 59 plants which recovered ammonia in 1964, 46 produced am-

**TABLE 47.—Production and disposal of coke-oven gas in the United States in 1964, by State**

(Thousand cubic feet)

| State | Produced | | Used in heating ovens | Surplus used or sold | | | Wasted |
|---|---|---|---|---|---|---|---|
| | Total | Per ton of coal coked | | Quantity | Value | | |
| | | | | | Total | Average | |
| Alabama | 61,671,951 | 9.69 | 29,235,060 | 31,416,699 | $4,146,673 | $0.132 | 1,020,192 |
| California, Colorado, Utah | 52,732,045 | 11.25 | 16,295,145 | 35,994,911 | 7,359,462 | .204 | 441,989 |
| Connecticut, Maryland, New Jersey, New York | 120,027,871 | 10.87 | 35,286,280 | 83,703,580 | 31,476,952 | .376 | 1,038,011 |
| Illinois | 34,418,282 | 10.22 | 9,924,745 | 23,449,856 | 4,330,828 | .185 | 1,043,681 |
| Indiana | 127,147,789 | 10.83 | 36,101,496 | 90,368,161 | 17,376,833 | .192 | 678,132 |
| Kentucky, Missouri, Tennessee, Texas | 27,277,565 | 9.42 | 14,254,313 | 12,539,573 | 1,616,002 | .129 | 483,679 |
| Michigan | 52,303,602 | 9.86 | 9,431,812 | 42,810,232 | 9,182,621 | .214 | 61,558 |
| Minnesota and Wisconsin | 11,609,390 | 9.63 | 6,188,481 | 5,191,479 | 1,007,469 | .194 | 229,430 |
| Ohio | 89,443,055 | 8.64 | 34,959,635 | 53,534,366 | 12,609,106 | .236 | 949,054 |
| Pennsylvania | 272,505,920 | 10.77 | 106,983,526 | 163,796,053 | 34,166,602 | .209 | 1,726,341 |
| West Virginia | 55,560,009 | 11.24 | 15,537,437 | 39,342,402 | 8,994,916 | .229 | 680,170 |
| Total 1964 | 904,697,479 | 10.37 | 314,197,930 | 582,147,312 | 132,267,464 | .227 | 8,352,237 |
| At merchant plants | 79,584,684 | 9.02 | 37,778,553 | 40,932,939 | 11,527,931 | .282 | 873,192 |
| At furnace plants | 825,112,795 | 10.52 | 276,419,377 | 541,214,373 | 120,739,533 | .223 | 7,479,045 |
| Total 1963 | 800,582,375 | 10.47 | 277,584,414 | 516,083,978 | 116,721,052 | .226 | 6,913,983 |

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**TABLE 48.—Surplus coke-oven gas used by producers in the United States and sold in 1964, by State**

(Thousand cubic feet)

| State | Used by producers— | | | | | |
|---|---|---|---|---|---|---|
| | Under boilers, etc. | | | In steel or allied plants | | |
| | Quantity | Value | | Quantity | Value | |
| | | Total | Average | | Total | Average |
| Alabama | 12,379,374 | $1,689,569 | $0.136 | 15,535,559 | $1,988,448 | $0.128 |
| California, Colorado, Utah | (1) | (1) | (1) | (1) | (1) | (1) |
| Connecticut, Maryland, New Jersey, New York | (1) | (1) | (1) | 66,196,861 | 23,555,749 | .356 |
| Illinois | (1) | (1) | (1) | 15,587,858 | 3,087,223 | .198 |
| Indiana | 8,242,851 | 1,528,991 | .185 | 79,085,353 | 14,467,157 | .183 |
| Kentucky, Missouri, Tennessee, Texas | 5,094,515 | 592,746 | .116 | (1) | (1) | (1) |
| Michigan | (1) | (1) | (1) | 36,015,724 | 7,465,587 | .207 |
| Minnesota and Wisconsin | (1) | (1) | (1) | (1) | (1) | (1) |
| Ohio | 7,301,176 | 1,575,341 | .216 | 39,706,291 | 9,824,235 | .247 |
| Pennsylvania | 26,768,385 | 4,944,434 | .185 | 133,862,889 | 28,537,669 | .213 |
| West Virginia | (1) | (1) | (1) | (1) | (1) | (1) |
| Undistributed | 14,702,603 | 3,114,170 | .212 | 74,279,511 | 16,253,545 | .219 |
| Total 1964 | 74,488,904 | 13,445,251 | .181 | 460,270,046 | 105,179,613 | .229 |
| At merchant plants | 9,771,397 | 1,661,068 | .170 | 2,905,293 | 627,642 | .216 |
| At furnace plants | 64,717,507 | 11,784,183 | .182 | 457,364,753 | 104,551,971 | .229 |
| Total 1963 | 80,049,588 | 15,662,374 | .196 | 390,342,904 | 88,296,205 | .226 |

| State | Sold | | | | | |
|---|---|---|---|---|---|---|
| | Distributed through city mains | | | For industrial use | | |
| | Quantity | Value | | Quantity | Value | |
| | | Total | Average | | Total | Average |
| Alabama | (1) | (1) | (1) | (1) | (1) | (1) |
| California, Colorado, Utah | | | | (1) | (1) | (1) |
| Connecticut, Maryland, New Jersey, New York | 15,715,237 | $7,527,608 | $0.479 | (1) | (1) | (1) |
| Illinois | | | | (1) | (1) | (1) |
| Indiana | (1) | (1) | (1) | (1) | (1) | (1) |
| Kentucky, Missouri, Tennessee, Texas | (1) | (1) | (1) | (1) | (1) | (1) |
| Michigan | | | | (1) | (1) | (1) |
| Minnesota and Wisconsin | | | | (1) | (1) | (1) |
| Ohio | | | | 6,526,899 | $1,209,530 | $0.185 |
| Pennsylvania | (1) | (1) | (1) | (1) | (1) | (1) |
| West Virginia | | | | (1) | (1) | (1) |
| Undistributed | 6,177,362 | 1,760,324 | .285 | 18,968,864 | 3,145,138 | .166 |
| Total 1964 | 21,892,599 | 9,287,932 | .424 | 25,495,763 | 4,354,668 | .171 |
| At merchant plants | 14,506,232 | 6,790,505 | .468 | 13,750,017 | 2,448,716 | .178 |
| At furnace plants | 7,386,367 | 2,497,427 | .338 | 11,745,746 | 1,905,952 | .162 |
| Total 1963 | 20,808,789 | 8,671,867 | .417 | 24,882,697 | 4,090,606 | .164 |

[1] Included with "Undistributed" to avoid disclosing individual company data.

monium sulfate; 3 produced diammonium phosphate; 1 produced monoammonium phosphate; and 10 recovered ammonia liquor. One plant produced both ammonium sulfate and ammonia liquor.

Coke-oven ammonia represented only about 3 percent of the estimated total of 7.6 million tons of ammonia produced by all processes in the United States in 1964. Production of synthetic ammonium sulfate as a byproduct of the chemical industry has increased steadily in recent years, with output in 1964 estimated at 1.6 million

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**TABLE 49.—Coke-oven gas and other gases used in heating coke ovens in the United States in 1964, by State [1]**

(Thousand cubic feet)

| State | Coke-oven gas | Blast-furnace gas | Natural gas | Total coke-oven gas equivalent |
|---|---|---|---|---|
| Alabama | 29,235,060 | | 8,012 | 29,243,072 |
| California, Colorado, Utah | 16,295,145 | 7,177,542 | 9,864 | 23,482,551 |
| Connecticut, Maryland, New Jersey, New York | 35,286,280 | [2] 12,609,803 | 1,335,367 | 49,231,450 |
| Illinois | 9,924,745 | 3,306,792 | | 13,231,537 |
| Indiana | 36,101,496 | 11,695,372 | 414,765 | 48,211,633 |
| Kentucky, Missouri, Tennessee, Texas | 14,254,313 | | | 14,254,313 |
| Michigan | 9,431,812 | 14,599,745 | | 24,031,557 |
| Minnesota and Wisconsin | 6,188,481 | | | 6,188,481 |
| Ohio | 34,959,635 | 3,336,322 | | 38,295,957 |
| Pennsylvania | 106,983,526 | 1,876,456 | 318,957 | 109,178,939 |
| West Virginia | 15,537,437 | 6,277,205 | | 21,814,642 |
| Total 1964 | 314,197,930 | 60,879,237 | 2,086,965 | 377,164,132 |
| At merchant plants | 37,778,553 | 1,345,372 | 337,016 | 39,460,941 |
| At furnace plants | 276,419,377 | 59,533,865 | 1,749,949 | 337,703,191 |
| Total 1963 | 277,584,414 | [2] 54,211,429 | 2,235,999 | 334,031,842 |

[1] Adjusted to an equivalent of 550 Btu per cubic foot.
[2] Includes small amount of producer gas.

tons, compared with 680,887 tons of ammonium sulfate produced at coke plants.

Table 50 shows production and sales of ammonia products and yields in terms of sulfate equivalent. Approximately the same percentages of each product were recovered as in 1963, but output of the various products increased 10 percent because of the larger quantity of coal carbonized. The average yield of ammonia decreased 4 percent, however, because of the increased rate of operation of ovens in 1964.

Most of the ammonium sulfate and virtually all di- and monoammonium phosphate produced at coke plants was sold for use as fertilizer materials. Some ammonia liquor is used in agriculture also, and some is used for producing a variety of other products, such as ammonium chloride, sulfuric acid, and household ammonia. Complete data on end uses are not available, however. Most of the production was consumed in the United States; only 6 percent of the 731,062 tons of ammonium sulfate and di- and monoammonium phosphate produced was exported.

Coke-oven operators sold 94 percent of their production of ammonia ($NH_3$ equivalent of all forms) in 1964, and sales were about 5 percent greater than in 1963. Although the quantity of each product sold also increased over that of 1963, yearend stocks of $NH_3$ equivalent increased over one-third because of a significant increase in the stock of ammonium sulfate, which increased from 114,000 tons in 1963 to 159,000 tons in 1964. Stocks of ammonia liquor and di- and monoammonium phosphate at the end of the year were at about the same level as at the end of 1963.

The average value per ton, f.o.b. plant, of ammonium sulfate increased $2.68 to $28.27, and the plant value for combined sales of di- and monoammonium phosphate increased $4.74 per ton to $98.76. These increases, combined with the larger quantity of products sold, resulted in a 16-percent increase in the value of all ammonia products sold in 1964. The total value of sales was not significantly affected by the slight decline in f.o.b. plant value of ammonia liquor.

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**TABLE 50.—Coke-oven ammonia produced in the United States and sold in 1964, by State**

(Short tons)

| State | Active plants [1] | Produced | | | | Sold [7] | | | | On hand Dec. 31 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sulfate equivalent | Pounds per ton of coal coked | As sulfate [2] | As liquor ($NH_3$ content) | As sulfate [2] | | As liquor ($NH_3$ content) | | Sulfate [2] | Liquor ($NH_3$ content) |
| | | | | | | Quantity | Value | Quantity | Value | | |
| Alabama | 7 | 60,959 | 19.15 | 60,125 | (3) | 55,806 | $1,775,365 | (3) | (3) | 17,090 | 16 |
| California, Colorado, Utah [4] | 3 | 53,075 | 22.65 | 53,075 | ---- | 51,433 | 3,875,104 | ---- | ---- | 10,737 | ---- |
| Connecticut, Maryland, New Jersey, New York [5] | 6 | 106,836 | 19.35 | 98,690 | (3) | 95,190 | 2,810,647 | (3) | (3) | 14,254 | 38 |
| Illinois | 4 | 36,258 | 22.23 | 36,258 | ---- | 30,932 | 1,008,257 | ---- | ---- | 7,484 | ---- |
| Indiana | 5 | 90,785 | 15.46 | 74,847 | (3) | 65,732 | 1,852,825 | (3) | (3) | 21,211 | 714 |
| Kentucky, Tennessee, Texas | 3 | 19,392 | 17.98 | (3) | (3) | (3) | (3) | (3) | (3) | 480 | 286 |
| Michigan [4] | 4 | 37,910 | 14.29 | (3) | (3) | (3) | (3) | (3) | (3) | 8,010 | 56 |
| Minnesota and Wisconsin | 2 | 6,512 | 13.33 | (3) | (3) | (3) | (3) | (3) | (3) | 785 | 134 |
| Ohio | 10 | 90,942 | 17.79 | 78,413 | (3) | 74,324 | 2,060,068 | (3) | (3) | 12,288 | 610 |
| Pennsylvania | 12 | 246,309 | 19.46 | 246,309 | ---- | 233,176 | 6,376,150 | ---- | ---- | 67,593 | ---- |
| West Virginia | 3 | 44,930 | 18.65 | 44,930 | ---- | 45,087 | 1,173,718 | ---- | ---- | 5,101 | ---- |
| Undistributed | ---- | ---- | ---- | 38,415 | 16,202 | 34,244 | 2,001,525 | 14,923 | $1,048,499 | ---- | ---- |
| Total 1964 | 59 | 793,908 | 18.49 | [6] 731,062 | 16,202 | [8] 685,924 | 22,933,659 | 14,923 | 1,048,499 | 165,033 | 1,854 |
| At merchant plants | 14 | 74,033 | 17.94 | 26,431 | 12,272 | 26,522 | 1,026,363 | 11,209 | 815,758 | 5,088 | 1,174 |
| At furnace plants | 45 | 719,875 | 18.54 | 704,631 | 3,930 | 659,402 | 21,907,296 | 3,714 | 232,741 | 159,945 | 680 |
| Total 1963 | 59 | 718,778 | 19.23 | 661,904 | 14,662 | 662,058 | 19,710,955 | 12,697 | 906,247 | 120,250 | 1,875 |

[1] Number of plants that recovered ammonia.
[2] Includes diammonium and monoammonium phosphate.
[3] Included with "Undistributed" to avoid disclosing individual company data.
[4] Figures include diammonium phosphate.
[5] Figures include monoammonium phosphate.
[6] Comprises 680,887 tons of ammonium sulfate and 50,175 tons of diammonium and monoammonium phosphate.
[7] Includes 46,281 tons of ammonium sulfate and diammonium phosphate valued at $1,350,507 exported.
[8] Comprises 639,633 tons of ammonium sulfate valued at $17,967,085 and 50,291 tons of diammonium and monoammonium phosphate valued at $4,966,574.

## CRUDE COAL TAR AND DERIVATIVES

Crude coal tar is a complex mixture of organic compounds that are condensed from the gas after it leaves the ovens. The bulk of the tar is recovered in collecting mains where the gas is cooled by spraying

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with ammonia liquor; most of the remainder is recovered from the primary coolers, where the gas undergoes further cooling.

Tar is produced at all oven-coke plants, and the quantities recovered represent, roughly, 4 to 5 percent of the weight of the coals carbonized. Recovery yields differ greatly among plants, depending upon the rank and grade of the coals used, oven temperatures, and other operating factors. Yields at individual plants for the year varied from about 4 to 11 gallons per ton of coal carbonized, with the yield for all plants averaging 8.75 gallons. This was virtually the same yield as in 1963. Yields were highest in California, Colorado, Pennsylvania, Utah, and West Virginia, where plants used larger percentages of higher-volatile coals. Yields were lowest in Minnesota and Wisconsin, where a large part of the production was foundry coke which was produced from higher percentages of low-volatile coals, as well as additions of anthracite. Yields were lower for merchant plants, most of which produced foundry coke.

Table 51 shows the quantities of tar produced, used by producers for various purposes, sold, and on hand at the end of the year. Although the average yield declined slightly, production increased 14 percent because of the larger amount of coal carbonized. Virtually all of the output in 1964 either was used by producers or was sold, as year-end stocks remained at about the same level as at the beginning of the year.

Fifty-six percent of the 763 million gallons of tar produced was used by producers. The bulk of this tar was partially refined or "topped," but about 30 percent was burned as fuel without processing. Producers also used minor quantities for a number of miscellaneous purposes, such as tarring ingots, road materials, and making tar paints. The remaining tar was sold to tar-distilling plants which refined it to produce a large number of tar derivatives.

The topping process, which is used by most of the coke plants that refine tar, is a method used to separate the low-boiling distillate fraction consisting principally of tar acids, bases, and naphthalenes from crude tar. The residue, known as soft pitch usually is burned as fuel. Furnace plants have found this process attractive because they can sell the distillate and retain the pitch which is used principally as fuel for open-hearth furnaces. This reduces the quantities of other fuels that would normally have to be purchased. The relative quantities of tar topped and burned, however, as well as the quantities sold, depend upon a number of economic factors such as the availability and current market prices of tar, tar distillates, and other substitute fuels. Merchant plants normally sell their tar because, unlike furnace plants, they do not have readily available markets for pitch, which makes up the bulk of the products recovered through topping.

Although most of the plants that processed tar in 1964 recovered only crude chemical oil and a refined tar or soft pitch, a few larger plants recovered a number of other tar derivatives, including creosote oil, cresylic acid, cresols, napthalene, phenol, pyridine, and medium and hard pitch. Statistics on some of these products could not be shown in this report, but the data were transmitted to the U.S. Tariff Commission which published them, along with similar data from tar distillers and petroleum refiners, in monthly and annual reports on synthetic organic chemicals. The 1-percent decrease in output of

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crude chemical oil and the 28-percent increase in hard pitch at coke plants indicate that production of napthalene, creosote oil, and other tar derivatives not shown, increased in 1964 as roughly the same quantities of tar were processed by producers in 1964 as in 1963.

The increased demand for various pitch products continued, and about one-third of the pitch produced by coke plants was sold rather than burned as fuel. Sales of pitch have increased steadily in recent years, and the quantity sold in 1964 was about 5 times greater than that sold in 1960.

**TABLE 51.—Coke-oven tar produced in the United States, used by producers, and sold in 1964, by State**

(Gallons)

| State | Produced | | Used by producers— | | |
|---|---|---|---|---|---|
| | Total | Per ton of coal coked | For refining or topping | As fuel | Otherwise |
| Alabama | 43,062,478 | 6.77 | (1) | (1) | (1) |
| California, Colorado, Utah | 48,395,076 | 10.32 | (1) | (1) | (1) |
| Connecticut, Maryland, New Jersey, New York | 99,439,758 | 9.00 | (1) | 9,807,430 | (1) |
| Illinois | 24,579,410 | 7.30 | | (1) | |
| Indiana | 100,659,819 | 8.57 | (1) | (1) | |
| Kentucky, Missouri, Tennessee, Texas | 19,277,519 | 6.65 | | | (1) |
| Michigan | 38,629,703 | 7.28 | | (1) | |
| Minnesota and Wisconsin | 7,175,557 | 5.95 | | | (1) |
| Ohio | 92,205,487 | 8.91 | (1) | 36,461,083 | (1) |
| Pennsylvania | 241,099,196 | 9.52 | 136,463,192 | 39,371,162 | 267,895 |
| West Virginia | 48,393,502 | 9.79 | (1) | (1) | |
| Undistributed | | | 157,493,506 | 42,232,136 | 103,051 |
| Total 1964 | 762,917,505 | 8.75 | 293,956,698 | 127,871,811 | 370,946 |
| At merchant plants | 54,801,347 | 6.21 | 649,246 | | |
| At furnace plants | 708,116,158 | 9.03 | 293,307,452 | 127,871,811 | 370,946 |
| Total 1963 | 671,875,628 | 8.78 | 289,568,551 | 91,313,170 | 557,788 |

| State | Sold for refining into tar products [2] | | | On hand Dec. 31 |
|---|---|---|---|---|
| | Quantity | Value | | |
| | | Total | Average | |
| Alabama | 26,899,278 | $3,100,319 | $0.115 | 3,319,366 |
| California, Colorado, Utah | 23,048,992 | 2,931,019 | .127 | 2,206,107 |
| Connecticut, Maryland, New Jersey, New York | 21,860,549 | 2,184,364 | .100 | 5,967,098 |
| Illinois | 23,984,853 | 2,322,170 | .097 | 387,860 |
| Indiana | 47,949,705 | 4,507,822 | .094 | 4,210,697 |
| Kentucky, Missouri, Tennessee, Texas | 19,272,722 | 2,075,138 | .108 | 312,762 |
| Michigan | 28,560,296 | 2,868,116 | .100 | 2,337,019 |
| Minnesota and Wisconsin | 7,214,482 | 710,215 | .098 | 782,491 |
| Ohio | 54,419,701 | 5,536,202 | .102 | 5,710,828 |
| Pennsylvania | 64,684,896 | 6,576,447 | .102 | 12,983,208 |
| West Virginia | 18,188,782 | 1,670,979 | .092 | 1,406,556 |
| Undistributed | | | | |
| Total 1964 | 336,084,256 | 34,482,791 | .103 | 39,623,992 |
| At merchant plants | 54,666,199 | 5,509,092 | .101 | 1,683,477 |
| At furnace plants | 281,418,057 | 28,973,699 | .103 | 37,940,515 |
| Total 1963 | 290,698,355 | 31,110,909 | .107 | 34,960,682 |

[1] Included with "Undistributed" to avoid disclosing individual company data.

[2] Comprises 31,936,362 gallons valued at $3,182,874 sold to affiliated companies and 304,147,894 gallons valued at $31,299,917 sold to other purchasers. Also includes small amount exported.



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Of significance also were pitch exports in 1964. Although only a portion of the 222,000 tons of coal-tar-pitch exported in 1964 was produced from tar refined at coke plants, it is estimated that at least two-thirds of the total was coke-plant pitch that was shipped principally to France for use as a binder for coal briquets.

The total value of tar and tar derivatives used and sold was $94.7 million, a 17-percent increase over 1963. Most of the increase was due to the larger quantity of crude tar used and sold, as the average value per gallon of crude tar decreased slightly. The quantity and value of the pitch used and sold, however, increased substantially over 1963 and added materially to the increase in total value of tar and tar products.

### CRUDE LIGHT OIL AND DERIVATIVES

Light oil, a light-colored liquid composed of a number of aromatic hydrocarbons, is extracted from the gas after tar, ammonia, and, in some instances, naphthalene, have been removed. Crude tar also contains a small amount of light oil, but this usually is not recovered by coke plants. Virtually all light oil produced at coke plants is recovered by an absorption process in which the gas is sprayed with a higher-boiling petroleum oil as the gas stream is channeled through absorption towers. After recovery, light oil is separated from the absorption oil by direct steam distillation.

About 3 gallons of light oil, equal to 1 percent of the weight of the coal, is recovered for each ton of coal carbonized. Yields vary with the kind of coals carbonized and with operating conditions, but an average of 2.92 gallons of light oil per ton of coal was recovered at the plants that extracted light oil in 1964. This was virtually the same average yield as in 1963.

Fifty-eight of the 64 plants active in 1964 produced light oil. Although this was one plant less than in 1963, production increased 14 percent because of the larger quantity of coal carbonized. Yearend stocks of light oil were significantly higher than at the end of 1963, but the amount on hand was small when related to production, and the quantities processed and sold both increased. Producers continued to sell an increasingly larger part of their output, and only 77 percent of the light oil produced was refined on the premises, compared with 85 percent in 1963, and 96 percent in 1957. The substantial increase in light oil sales in recent years is attributed principally to the inability of some plants to produce benzene that will meet the specifications required for certain recent applications. These plants sell light oil to petroleum-refining companies which process it along with petroleum fractions into benzene and a variety of other chemical intermediates.

Table 52 shows the crude light oil produced and refined by producers, and derived products produced and sold in 1964.

Light oil is refined by a number of processes involving fractional distillation, and the principal products recovered at coke plants are benzene, toluene, xylene, and solvent naphtha. Thirty-five of the 58 plants that produced light oil also processed it, recovering one or more of the above products. A number of plants also shipped their light oil production to affiliated plants for distillation.

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Table 53 shows the yield of various products from the refining of crude light oil. As with other coal-chemical materials, yields vary somewhat, but approximately 85 percent of the light oil processed is recovered as salable products. The average yield of toluene decreased slightly in 1964, while benzene, solvent naphtha, and other product yields increased. The xylene yield remained at the 1963 level.

Table 54 shows the quantities of the various grades of benzene and toluene produced at coke plants, while table 55 shows the principal products produced and sold. Roughly two-thirds of the benzene and four-fifths of the toluene produced was nitration grade (1° C), and most of the remainder was industrial grade (2° C). Motor-grade benzene, which has declined steadily in use since World War II, accounted for

**TABLE 52.—Coke-oven crude light oil produced in the United States and derived products produced and sold in 1964, by State**

(Gallons)

| State | Active plants[1] | Crude light oil | | | | Derived products | | |
|---|---|---|---|---|---|---|---|---|
| | | Produced | Per ton of coal coked | Refined on premises[2] | On hand Dec. 31 | Produced | Sold[3] | |
| | | | | | | | Quantity | Value |
| Alabama | 7 | 14,885,230 | 2.34 | 14,727,975 | 506,427 | 11,795,967 | 12,010,566 | $2,455,824 |
| California, Colorado, Utah | 3 | 16,001,188 | 3.41 | 10,733,908 | 239,116 | 9,539,165 | 9,206,396 | 1,688,503 |
| Connecticut, Maryland, New Jersey, New York | 6 | 35,282,841 | 3.19 | 31,088,030 | 865,052 | 25,544,652 | 25,884,348 | 5,272,064 |
| Illinois and Michigan | 8 | 22,771,284 | 2.66 | 13,887,844 | 651,213 | 11,509,355 | 11,539,106 | 2,475,232 |
| Indiana | 4 | 32,808,793 | 2.94 | 20,652,863 | 1,958,540 | 16,064,769 | 16,619,612 | 3,373,350 |
| Kentucky, Missouri, Tennessee, Texas, West Virginia | 8 | 22,593,950 | 2.88 | 9,406,074 | 459,379 | 8,423,717 | 7,913,289 | 1,540,097 |
| Ohio | 10 | 28,738,521 | 2.84 | 21,544,177 | 543,069 | 19,200,188 | 18,574,570 | 3,634,143 |
| Pennsylvania | 12 | 75,587,160 | 2.99 | 70,190,149 | 1,961,552 | 63,091,293 | 59,897,483 | 12,631,060 |
| Total 1964 | 58 | 248,668,967 | 2.92 | 192,231,020 | 7,184,348 | 165,169,106 | 161,645,370 | 33,070,273 |
| At merchant plants | 12 | 16,086,996 | 2.22 | 9,527,396 | 875,868 | 8,285,398 | 8,127,587 | 1,567,645 |
| At furnace plants | 46 | 232,581,971 | 2.99 | 182,703,624 | 6,308,480 | 156,883,708 | 153,517,783 | 31,502,628 |
| Total 1963 | 59 | 218,165,707 | 2.91 | 185,794,876 | 4,680,775 | 156,010,453 | 150,997,370 | 32,180,467 |

[1] Number of plants that recovered crude light oil.
[2] Includes small quantity of material also reported in sales of crude light oil in table 43.
[3] Excludes 53,702,264 gallons of crude light oil valued at $6,709,092 sold as such.

**TABLE 53.—Yield of light-oil derivatives from refining crude light oil at oven-coke plants in the United States**

(Percent)

| Year | Benzene | | Toluene (all grades) | Xylene (all grades) | Solvent naphtha (crude and refined) | Other light-oil products |
|---|---|---|---|---|---|---|
| | Motor | All other grades | | | | |
| 1929 | 54.4 | 12.8 | 9.4 | (1) | 3.7 | 3.4 |
| 1939 | 48.6 | 15.4 | 12.1 | 2.5 | 2.9 | 3.8 |
| 1949 | 9.5 | 55.6 | 12.5 | 3.3 | 2.3 | 3.2 |
| 1957–59 (average) | .5 | 60.4 | 13.5 | 3.9 | 2.1 | 2.3 |
| 1961 | .5 | 60.5 | 14.3 | 3.8 | 2.3 | 1.8 |
| 1962 | .9 | 60.5 | 14.4 | 4.0 | 2.3 | 2.2 |
| 1963 | 1.6 | 60.5 | 13.9 | 3.7 | 1.9 | 2.4 |
| 1964 | .4 | 61.9 | 13.3 | 3.7 | 2.3 | 4.3 |

[1] Included with "Solvent naphtha (crude and refined)."

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**TABLE 54.—Benzene and toluene produced at oven-coke plants in the United States, by grade**

(Gallons)

| Year | Benzene | | | | Toluene | | |
|---|---|---|---|---|---|---|---|
| | Motor | Nitration (1° C) | Industrial (2° C) | All other | Nitration (1° C) | Industrial (2° C) | All other |
| 1941 | 106,372,000 | 15,414,500 | 18,286,400 | 4,182,600 | 14,689,800 | 13,268,500 | 1,378,900 |
| 1949 | 20,923,700 | 28,988,700 | 91,717,300 | 2,035,600 | 20,808,300 | 6,317,200 | 545,100 |
| 1957–59 (average) | 1,240,500 | 83,881,700 | 50,645,700 | 5,193,600 | 24,810,700 | 6,196,400 | (1) |
| 1961 | 1,027,400 | 85,648,800 | 33,111,900 | 1,444,660 | 22,820,100 | 5,586,700 | (1) |
| 1962 | 1,786,200 | 81,831,600 | 32,062,800 | 332,800 | 22,140,900 | 5,089,800 | (1) |
| 1963 | 2,907,000 | 78,071,800 | 33,699,700 | 655,900 | 20,514,100 | 5,280,300 | (1) |
| 1964 | 863,900 | 81,508,400 | 34,783,300 | 2,652,500 | 19,959,300 | 5,561,200 | (1) |

[1] Included with "Industrial (2° C)" to avoid disclosing individual company data.

less than 1 percent of the benzene output. Both production and sales of benzene and xylene increased in 1964. Toluene sales also increased, but production was slightly lower than in 1963.

Although coke-oven light oil was the principal source of benzene until 1950, and toluene and xylene until the beginning of World War II, it now furnishes the smaller part of the total output of these products. According to preliminary data published by the U.S. Tariff Commission, only 15 percent of the benzene, 5 percent of the toluene, and 2 percent of the xylene was produced by coke-oven operators in 1964. The bulk of these products now is derived from petroleum, although a part of the production credited to tar distillers and petroleum processors was derived from coke-oven light oil that was sold by producers, rather than refined.

Table 56 shows estimated consumption of commerical benzene in the United States, by use. These data, published annually by the Coal-Chemicals Committee of the American Coke and Coal Chemicals Institute, show that most of the benzene was used for producing styrene, synthetic phenol, and cyclohexane. About one-third of the estimated 802 million gallons of benzene used in 1964 was used in making styrene monomer, which subsequently was used principally for manufacturing plastics, synthetic rubber, and protective coatings. About one-fifth of the benzene was used for producing cyclohexane, which is used principally as a nylon intermediate, and 18 percent, for, synthetic phenol, used principally for phenolic resins, epoxy resins, nylon 6, and polycarbonates.

Similar use data for toluene were not available, but large quantities were dealkylated to benzene which, currently, is in greater demand. Large quantities of toluene are used also as an additive to increase the octane rating of aviation and motor gasoline. This use has declined somewhat in importance, however, because of the increased number of compact cars in use, and the replacement of propeller-type airplanes by jets. Other uses for toluene are chemicals, plastics, explosives, paints, varnishes, lacquers, and solvent.

The average values of virtually all light-oil derivatives sold by producers in 1964 were slightly lower than in 1963. Spot prices,

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f.o.b. plant, of the principal products, as published by the trade journals, remained at the same level throughout the year, however, with benzene and toluene selling at $0.25 and $0.21, respectively, per gallon, while the price of xylene ranged from $0.25 to $0.26 per gallon.

**TABLE 55.—Light-oil derivatives produced at oven-coke plants in the United States and sold in 1964, by State**

(Gallons)

| State | Benzene (all grades except Motor) | | | | Toluene (all grades) | | | |
|---|---|---|---|---|---|---|---|---|
| | Produced | Yield from crude light oil refined (percent) | Sold | | Produced | Yield from crude light oil refined (percent) | Sold | |
| | | | Quantity | Value | | | Quantity | Value |
| Alabama | 9,021,421 | 61.3 | 9,417,350 | $2,000,480 | 1,787,580 | 12.1 | 1,637,848 | $282,776 |
| California, Colorado, Utah | 6,455,466 | 60.1 | 6,843,499 | 1,204,542 | 1,023,309 | 9.5 | 1,047,515 | 185,487 |
| Illinois and Michigan | 9,401,227 | 67.7 | 9,510,232 | 2,106,657 | 1,600,013 | 11.5 | 1,536,609 | 293,655 |
| Indiana | 12,473,893 | 60.4 | 13,409,037 | 2,782,187 | 2,355,038 | 11.4 | 2,468,296 | 449,732 |
| Maryland and New York | 20,424,928 | 65.7 | 20,687,679 | 4,318,850 | 3,424,204 | 11.0 | 3,423,701 | 657,408 |
| Ohio | 14,339,830 | 66.6 | 14,021,139 | 2,741,092 | 3,291,697 | 15.3 | 3,145,109 | 592,613 |
| Pennsylvania | 40,726,815 | 58.0 | 39,009,427 | 8,899,085 | 10,633,972 | 15.2 | 10,942,713 | 2,025,759 |
| Tennessee, Texas, West Virginia | 6,100,624 | 64.9 | 6,171,838 | 1,209,860 | 1,404,696 | 14.9 | 1,327,981 | 241,470 |
| Total 1964 | 118,944,204 | 61.9 | 119,070,201 | 25,262,753 | 25,520,509 | 13.3 | 25,529,772 | 4,728,900 |
| At merchant plants | 5,689,942 | 59.7 | 5,548,615 | 1,137,357 | 1,348,446 | 14.2 | 1,332,864 | 259,305 |
| At furnace plants | 113,254,262 | 62.0 | 113,521,586 | 24,125,396 | 24,172,063 | 13.2 | 24,196,908 | 4,469,595 |
| Total 1963 | 112,427,410 | 60.5 | 110,200,042 | 24,192,014 | 25,794,419 | 13.9 | 24,825,639 | 4,849,243 |

| State | Xylene (all grades) | | | | Solvent naphtha (crude and refined) | | | |
|---|---|---|---|---|---|---|---|---|
| | Produced | Yield from crude light oil refined (percent) | Sold | | Produced | Yield from crude light oil refined (percent) | Sold | |
| | | | Quantity | Value | | | Quantity | Value |
| Alabama | 465,027 | 3.2 | 459,696 | $112,549 | 95,653 | 0.6 | 104,001 | $22,190 |
| California, Colorado, Utah | 355,629 | 3.3 | 367,707 | 83,682 | 325,704 | 3.0 | 341,821 | 75,444 |
| Illinois and Michigan | 235,900 | 1.7 | 223,050 | 49,366 | (1) | (1) | (1) | (1) |
| Indiana | 388,296 | 1.9 | 327,249 | 68,500 | 506,086 | 1.5 | 238,599 | 63,697 |
| Maryland and New York | 842,279 | 2.7 | 926,981 | 215,015 | (2) | (2) | (2) | (2) |
| Ohio | 809,137 | 3.8 | 790,001 | 186,896 | 645,247 | 3.0 | 618,321 | 113,542 |
| Pennsylvania | 3,603,258 | 5.1 | 3,688,402 | 818,740 | 2,911,209 | 2.6 | 2,889,944 | 563,710 |
| Tennessee, Texas, West Virginia | 419,872 | 4.5 | 352,264 | 81,769 | (2) | (2) | (2) | (2) |
| Total 1964 | 7,119,398 | 3.7 | 7,135,350 | 1,616,517 | 4,483,899 | 2.3 | 4,192,686 | 838,583 |
| At merchant plants | 332,049 | 3.5 | 342,202 | 83,945 | 34,928 | .4 | 42,549 | 8,896 |
| At furnace plants | 6,787,349 | 3.7 | 6,793,148 | 1,532,572 | 4,448,971 | 2.4 | 4,150,137 | 829,687 |
| Total 1963 | 6,888,320 | 3.7 | 7,123,527 | 1,693,892 | 3,560,953 | 1.9 | 3,359,390 | 712,974 |

[1] Included with Indiana.
[2] Included with Pennsylvania.

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**TABLE 56.—Estimated consumption of commercial benzene (excluding Motor grade) in the United States, by use [1]**

(Thousand gallons)

| Use | 1957–59 (average) | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Styrene | 160,000 | 210,000 | 224,000 | [2] 232,000 | 270,000 |
| Phenol (synthetic) | 74,000 | 100,000 | 106,000 | [2] 121,000 | 143,000 |
| Dodecylbenzene | 36,000 | 37,000 | 40,000 | [2] 37,000 | 37,000 |
| Cyclohexane | 30,000 | 55,000 | 65,000 | [2] 120,000 | 162,000 |
| Aniline | 14,000 | 16,000 | 17,000 | 19,000 | 21,000 |
| DDT | 14,000 | 16,000 | 16,000 | 17,000 | 17,000 |
| Dichlorobenzene and monochlorobenzene | 11,000 | 15,000 | 16,000 | [2] 19,000 | 20,000 |
| Maleic anhydride | 9,000 | 14,000 | 15,000 | [2] 14,000 | 20,000 |
| Benzene hexachloride | 3,000 | 2,000 | 1,000 | (3) | ---------- |
| Diphenyls | 4,500 | 5,000 | 5,000 | 5,000 | 5,000 |
| Nitrobenzene | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Miscellaneous | 21,500 | 9,000 | 17,000 | 20,000 | 20,000 |
| Exported | 7,000 | 46,000 | 41,000 | 65,000 | 85,000 |
| Total | 386,000 | 527,000 | 565,000 | [2] 671,000 | 802,000 |

[1] Coal-Chemicals Committee, American Coke and Coal-Chemicals Institute, Washington, D.C.
[2] Revised figure.

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# Fuel Briquets and Packaged Fuel

By Eugene T. Sheridan[1]

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## GENERAL SUMMARY

PRODUCTION of both fuel briquets and packaged fuel continued to decline in 1964, and output of each fuel was roughly one-third less than in 1963. This decline continued the steady downward trend in production that began shortly after World War II when natural gas and fuel oil began replacing solid fuels for residential heating.

Ten briquet plants with a total maximum productive capacity of 2.1 million tons produced 359,000 tons of fuel briquets. Nine packaged-fuel plants with a combined maximum annual productive capacity of 78,000 tons produced 9,300 tons of packaged fuel. All plants in both industries operated at reduced rates throughout the year.

Most briquets were produced in Wisconsin, and most packaged fuel was produced in Michigan. Briquets were produced also in Michigan, Missouri, North Dakota, and West Virginia. In addition to Michigan, Illinois, Indiana, Minnesota, Ohio, and Virginia produced packaged fuels.

Exports of briquets increased 44 percent over that in 1963, but were 69 percent below the average quantity exported in 1957–59. Imports were over 2.5 times larger than in 1963, but about 28 times greater than the average quantity imported in 1957–59.

The total value of shipments, f.o.b. plant, of both fuels was $6.2 million—$5.9 million for briquets and $241,000 for packaged fuel. Briquets were sold at an average plant value of $16.47 per ton; packaged fuel was sold at an average plant value of $24.26 per ton.

[1] Supervisory mineral specialist.



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**TABLE 1.—Salient fuel-briquet and packaged-fuel statistics**

| | 1957–59 (average) | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Fuel briquets: | | | | | |
| United States: | | | | | |
| Production short tons | 1,002,054 | 572,264 | 570,023 | 551,207 | 359,232 |
| Shipments [1] do | 999,444 | 567,779 | 569,913 | 551,459 | 360,015 |
| Value of shipments | $13,471,783 | $7,956,102 | $8,597,021 | $8,207,989 | $5,928,475 |
| Average per ton, f.o.b. plant | $13.48 | $14.01 | $15.08 | $14.88 | $16.47 |
| Imports short tons | 406 | 7,338 | 8,396 | 4,620 | 11,593 |
| Exports do | 58,294 | 12,731 | 18,596 | 12,380 | 17,857 |
| Consumption, apparent [2] do | 941,556 | 562,386 | 559,713 | 543,699 | 353,751 |
| World production do | 117,000,000 | 124,600,000 | 131,000,000 | 133,900,000 | 129,900,000 |
| Packaged fuel: | | | | | |
| United States: | | | | | |
| Production do | 38,923 | 19,180 | 17,439 | 14,215 | 9,322 |
| Shipments do | 38,432 | 19,005 | 17,259 | 14,555 | 9,955 |
| Value of shipments | $868,112 | $441,497 | $394,065 | $340,021 | $241,462 |
| Average per ton, f.o.b. plant | $22.59 | $23.23 | $22.83 | $23.36 | $24.26 |

[1] Includes briquets used by producers.
[2] Shipments plus imports minus exports. Import and export data do not include briquets made from petroleum products.

## SCOPE OF REPORT

This report covers the fuel-briquet and packaged-fuel industries for the calendar year 1964. Similar reports on the fuel-briquet industry have been published each year since 1907, except in 1910 when no data were collected. A report on the packaged-fuel industry has been published annually since 1935.

The data presented include only processed fuels made from coals, petroleum coke, and lignite char. Specifically excluded were briquets made from wood and nutshell charcoal, as these materials are forest products, outside the scope of the Bureau's commodity programs. Except where noted, all data were compiled from reports submitted voluntarily by producers.

The two industries are similar in that both produce a high-quality solid fuel by compacting screenings or other fines. The products differ, however, in physical properties and manner of use. Whereas briquets usually are pillow-shaped pieces, 2 to 4 inches long, packaged fuel is produced as 3- or 4-inch cubes, six or eight of which are wrapped together in heavy paper to form a package weighing from 10 to 15 pounds. Briquets, generally made with a water-insoluble binder, are handled as other bulk solid fuels and used chiefly for cooking and residential heating. Packaged fuel, which must be stored indoors to prevent deterioration, is a specialty fuel, used principally for space heating to supplement other fuels in the months preceding and following the regular heating season. Briquet plants are relatively large and usually are located at mines or coal unloading docks. Most packaged-fuel plants are small and operate in conjunction with coalyards.

Data on production and shipments of fuel briquets are shown by geographic regions, arbitrarily established, to avoid revealing individual plant data in States with less than three producers. The States in each region are: Eastern—West Virginia; Central—Michigan and Wisconsin; Western—Missouri and North Dakota.

The term "capacity" in this report refers to the total maximum quantity of fuel that each industry could produce if all active plants,

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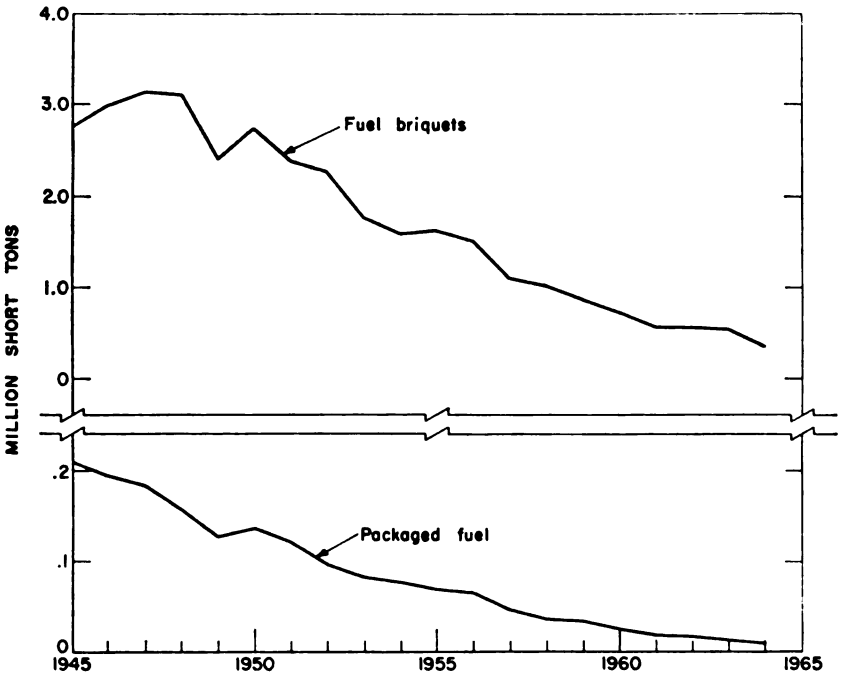


FIGURE 1.—Production of fuel briquets and packaged fuel in the United States, 1945–64.

working their regular number of shifts each day but allowing for unavoidable shutdowns, operated at their maximum rate for a year. The quantities shown include only plants that reported production for 1964. These plants, however, accounted for virtually the entire capacity of both industries, as only two small packaged-fuel plants were reported idle during 1964.

The terms "consumption" and "distribution" are used synonymously, as it was assumed that, except for the briquets exported, the fuels were consumed in the States where shipped by producers.

No information was collected on stocks, as briquets and packaged fuel usually are sold as produced.

## FUEL BRIQUETS

### CAPACITY

Ten briquet plants with a total maximum annual productive capacity of 2.1 million tons were active in 1964. One small plant that operated in 1963 was abandoned, and the capacity of the industry decreased 8 percent.

Individual plant capacities varied from less than 100,000 tons to more than 500,000 tons; only three plants had capacities in excess of 200,000 tons. During the past decade, the number of operating plants

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**TABLE 2.—Annual capacity and production of fuel-briquet plants in the United States**

| | Active plants | Annual capacity (short tons) | Production | |
|---|---|---|---|---|
| | | | Short tons | Percent of capacity |
| 1960 | 14 | 2,624,500 | 744,385 | 28.4 |
| 1961 | 12 | 2,344,500 | 572,264 | 24.4 |
| 1962 | 11 | 2,307,500 | 570,023 | 24.7 |
| 1963 | 11 | 2,327,500 | 551,207 | 23.7 |
| 1964: | | | | |
| Plants with capacity of— | | | | |
| Less than 25,000 tons | | | | |
| 25,000 to less than 100,000 tons | 2 | (1) | (1) | (1) |
| 100,000 to less than 200,000 tons | 5 | 643,500 | 152,060 | 23.6 |
| 200,000 to less than 400,000 tons | | | | |
| 400,000 or more tons | 3 | 1,500,000 | 207,172 | 13.8 |
| Total | 10 | 2,143,500 | 359,232 | 16.8 |
| Plants with production of— | | | | |
| Less than 5,000 tons | | | | |
| 5,000 to less than 10,000 tons | 1 | (2) | (2) | (2) |
| 10,000 to less than 25,000 tons | 4 | 396,000 | 61,954 | 15.6 |
| 25,000 to less than 100,000 tons | 4 | 1,747,500 | 297,278 | 17.0 |
| 100,000 or more tons | 1 | (3) | (3) | (3) |
| Total | 10 | 2,143,500 | 359,232 | 16.8 |

[1] Combined with "100,000 to less than 200,000 tons" to avoid disclosing individual company data.
[2] Combined with "10,000 to less than 25,000 tons" to avoid disclosing individual company data.
[3] Combined with "25,000 to less than 100,000 tons" to avoid disclosing individual company data.

has declined steadily, and the current capacity of the industry is, roughly, one-half as large as it was in 1955.

All plants operated at reduced rates during the year, and the industry produced at only 16.8 percent of its capacity.

Data on capacity and operating rates are shown in table 2.

## PRODUCTION

Demand for briquets continued to decline in 1964, and output for the year was about one-third less than in 1963. The current decrease continued the trend that began in 1948 when fuel oil and natural gas moved into fuel markets in the Midwest and North Central States formerly supplied by solid fuels. The year's production of 359,000 tons was about one-third as large as the amount produced annually in the base years, 1957–59, and only about one-tenth as large as output in 1947, the year of peak production.

Ten plants in five States reported production. Wisconsin, with five plants, was the largest producer. West Virginia, with one plant, ranked second in output. Together, these States accounted for nearly three-fourths of the total production. Other producing States, in order of output, were Michigan, Missouri, and North Dakota.

Demand for briquets is seasonal, and most plants operated at reduced rates during the summer months. Monthly production ranged from 64,000 tons in January to less than 11,000 tons in July.

The quantity of briquets produced and shipped, and the value of shipments are shown in tables 3 and 4.

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**TABLE 3.—Production and shipments of fuel briquets in the United States, by region**

| Region | Active plants | Production (short tons) | Shipments [1] | | |
|---|---|---|---|---|---|
| | | | Short tons | Value | |
| | | | | Total | Average |
| 1963: | | | | | |
| Eastern States | 1 | (2) | (2) | (2) | (2) |
| Central States | 7 | 293,610 | 290,066 | $4,627,934 | $15.95 |
| Western States | 3 | 257,597 | 261,393 | 3,580,055 | 13.70 |
| Total | 11 | 551,207 | 551,459 | 8,207,989 | 14.88 |
| 1964: | | | | | |
| Eastern States | 1 | (2) | (2) | (2) | (2) |
| Central States | 6 | 210,833 | 213,640 | 3,434,737 | 16.08 |
| Western States | 3 | 148,399 | 146,375 | 2,493,738 | 17.04 |
| Total | 10 | 359,232 | 360,015 | 5,928,475 | 16.47 |

[1] Includes small amount used by producers in 1964.
[2] Included with "Western States" to avoid disclosing individual company data.

**TABLE 4.—Production of fuel briquets in the United States in 1964, by month**

| Month | Short tons | Month | Short tons | Month | Short tons |
|---|---|---|---|---|---|
| January | 64,119 | May | 14,017 | September | 38,368 |
| February | 25,067 | June | 15,124 | October | 53,810 |
| March | 12,759 | July | 10,630 | November | 37,924 |
| April | 16,243 | August | 11,143 | December | 60,028 |

## RAW MATERIALS

**Fuels.**—Briquets were manufactured from seven different fuels, but 60 percent of the total fuel used was low-volatile bituminous coal. Other fuels in order of the quantitites consumed were petroleum coke, lignite char, high-volatile bituminous coal, Pennsylvania anthracite, semianthracite, and other anthracite.

Five of the 10 active plants used more than one type of fuel. In most instances, these plants combined the fuels to produce a composite briquet.

Nine percent of the fuels consumed originated from screenings in coalyards; the remainder was supplied chiefly by mines and unloading docks.

The average value per ton of all raw fuels consumed was $8.51, a 5-percent increase over the average value in 1963. The total value of all fuels used for briquets was $2.9 million.

**Binders.**—A total of 26,000 tons of binding materials was used for manufacturing fuel briquets. Included in this quantity was a small quantity of spray oil used at two plants for dustproofing. Nine of the active plants used petroleum asphalt exclusively for binder. Asphalt was preferred because it has good cohesive properties, is relatively low in cost, has a low ash content, and is insoluble in water, thereby making the briquets weatherproof. One plant that manufactured barbecue briquets from lignite char used starch for a binder because asphalt is unsuitable for this type of briquets.

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Excluding water, binders constituted 7 percent of the total raw materials. The quantities consumed at individual plants, however, ranged up to 10 percent of the total raw materials.

Binders consumed, including spray oil, averaged $31.26 per ton, and their total value was $820,000. This was about one-fifth the value of total raw materials.

The quantities and values of raw materials used in 1964 are shown in tables 5 and 6.

**TABLE 5.—Raw fuels used in making fuel briquets in the United States in 1964**

| Type | Number of plants | Used | | |
|---|---|---|---|---|
| | | Short tons | Value | |
| | | | Total | Average |
| Anthracite: | | | | |
| Pennsylvania | 2 | (1) | (1) | (1) |
| Other than Pennsylvania | 1 | (1) | (1) | (1) |
| Semianthracite | 1 | (1) | (1) | (1) |
| Bituminous coal: | | | | |
| Low-volatile | 8 | 206,675 | $1,706,151 | $8.26 |
| High-volatile | 1 | (1) | (1) | (1) |
| Petroleum coke | 5 | 98,568 | 817,571 | 8.29 |
| Lignite char | 1 | (1) | (1) | (1) |
| Undistributed | | 37,258 | 387,982 | 10.41 |
| Total | [2] 10 | 342,501 | 2,913,704 | 8.51 |

[1] Included with "Undistributed" to avoid disclosing individual company data.
[2] Some plants used more than one type of raw fuel; hence, the number of plants exceeds the total shown.

**TABLE 6.—Quantity and value of raw materials used in making fuel briquets in the United States in 1964, by region**

| Region | Short tons | Value | |
|---|---|---|---|
| | | Total | Average |
| Fuels: | | | |
| Eastern States | (1) | (1) | (1) |
| Central States | 203,717 | $1,894,932 | $9.30 |
| Western States | 138,784 | 1,018,772 | 7.34 |
| Total | 342,501 | 2,913,704 | 8.51 |
| Binders: [2] | | | |
| Eastern States | (1) | (1) | (1) |
| Central States | 16,212 | 429,729 | 26.51 |
| Western States | 10,031 | 390,556 | 38.93 |
| Total | 26,243 | 820,285 | 31.26 |
| Fuels and binders: | | | |
| Eastern States | (1) | (1) | (1) |
| Central States | 219,929 | 2,324,661 | 10.57 |
| Western States | 148,815 | 1,409,328 | 9.47 |
| Grand total | 368,744 | 3,733,989 | 10.13 |

[1] Included with "Western States" to avoid disclosing individual company data.
[2] Includes small amount of spray oil used by two plants for dustproofing briquets.

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## SHIPMENTS

Briquets were distributed in 41 States and the District of Columbia in 1964, but the quantities received by individual States varied greatly. Michigan, the largest consumer, received 71,000 tons of briquets, one-fifth the total distributed. Wyoming, the smallest consumer, received only five tons.

The major briquet markets are in eight Central and North Central States—Indiana, Michigan, Minnesota, Missouri, North Dakota, Ohio, South Dakota, and Wisconsin. These States received three-fourths of all briquets distributed. Michigan, Wisconsin, and Minnesota, the principal consumers, received about one-half of the briquet shipments.

Approximately three-fourths of the plant shipments were by rail. The mode of transportation varied, however, with the producing region. Virtually all briquets produced in West Virginia were shipped by rail, because most markets were too distant for practical delivery by truck. The bulk of the shipments in the Central States were by rail also, except for a few States that retained most of their output and delivered principally by truck.

Except for barbecue briquets and a small quantity of the conventional heating and cooking briquets that were sold in bags, briquets were shipped as bulk fuel. Shipments by State of origin were not shown because of the small number of producing companies.

The destinations of briquets used and sold by producers and method of shipment in 1964 are shown in tables 7 and 8.

**TABLE 7.—Destination of fuel briquets used and sold by producers [1]**

(Short tons)

| Destination | 1963 | 1964 | Destination | 1963 | 1964 |
|---|---|---|---|---|---|
| Arizona | 185 | 170 | New York | 1,941 | 1,815 |
| California | 3,815 | 3,560 | North Carolina | 17,726 | 14,923 |
| Colorado | 374 | 350 | North Dakota | 19,535 | 17,006 |
| Connecticut | 196 | 180 | Ohio | 29,343 | 19,363 |
| District of Columbia | 113 | 52 | Oklahoma | 38 | 40 |
| Florida | | 52 | Oregon | 361 | 340 |
| Hawaii | 60 | 60 | Pennsylvania | 512 | 414 |
| Idaho | 14 | 10 | Rhode Island | 15 | 10 |
| Illinois | 15,880 | 10,018 | South Carolina | 576 | 349 |
| Indiana | 38,599 | 24,472 | South Dakota | 20,512 | 16,553 |
| Iowa | 13,833 | 9,230 | Tennessee | 556 | 494 |
| Kansas | 1,011 | 940 | Texas | 558 | 520 |
| Kentucky | 2,644 | 1,972 | Utah | 356 | 330 |
| Maryland | 873 | 803 | Virginia | 27,172 | 23,123 |
| Massachusetts | 518 | 390 | Washington | 1,530 | 1,436 |
| Michigan | 94,315 | 71,113 | West Virginia | 302 | 105 |
| Minnesota | 59,218 | 47,912 | Wisconsin | 88,798 | 57,630 |
| Missouri | 24,755 | 18,709 | Wyoming | 3 | 5 |
| Montana | 101 | 90 | | | |
| Nebraska | 1,956 | 1,973 | Total | 470,528 | 348,615 |
| Nevada | 20 | 20 | Exported | 80,931 | 11,400 |
| New Hampshire | 52 | 53 | | | |
| New Jersey | 2,060 | 1,930 | Grand total | 551,459 | 360,015 |
| New Mexico | 102 | 100 | | | |

[1] Based upon reports from producers showing destination of briquets used and sold.

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TABLE 8.—Shipments of fuel briquets in the United States, by method of transportation [1]

(Short tons)

| Origin | 1963 | | | 1964 | | |
|---|---|---|---|---|---|---|
| | Rail | Truck | Total | Rail | Truck | Total |
| Eastern States | (2) | (2) | (2) | (2) | (2) | (2) |
| Central States | 187,979 | 102,087 | 290,066 | 134,853 | 78,787 | 213,640 |
| Western States | 234,797 | 26,596 | 261,393 | 126,525 | 19,850 | 146,375 |
| Total | 422,776 | 128,683 | 551,459 | 261,378 | 98,637 | 360,015 |

[1] Includes shipments destined for export as reported by producers directly to the Bureau of Mines.
[2] Included with "Western States" to avoid disclosing individual company data.

## VALUE AND PRICE

The average value per ton, f.o.b. plant, of all briquets distributed in 1964 was $16.47, an increase of 11 percent over the preceding year. The total value of shipments decreased 28 percent, however, because of the substantial decline in the quantity of briquets shipped.

Plant prices varied according to the area of production. Briquets produced in the Eastern region had a relatively low value because they were produced at the mine; briquets produced in the Central and Western regions generally had higher values because most were produced from fuels that originated in other areas. Briquets produced in the East, however, were shipped to more distant markets, and transportation costs were reflected in the price of the briquet rather than in the raw fuel. In general, briquets that were produced and sold in the Central and Western States were competitively priced at the retail level with briquets that were produced in the East and shipped to more distant markets.

The values of briquets shipped in 1964, f.o.b. plant, are shown in table 3. Because of the relatively small quantity of briquets distributed, wholesale and retail prices of briquets are not quoted by the coal trade journals and are generally unavailable.

## FOREIGN TRADE

Foreign trade was small; only 12,000 tons of briquets was imported and 18,000 tons exported, according to data compiled from records of the Bureau of the Census, U.S. Department of Commerce.

Imports in 1964 increased about 2½ times over 1963, but were about 28 times larger than the average quantity imported annually in 1957–59. All were imported from Canada, with about one-half entering the United States through the Dakota customs district and the other one-half through the Montana-Idaho customs district.

Exports increased 44 percent over the previous year but were 69 percent below the average quantity exported in 1957–59. Canada was the principal export market, receiving 89 percent of the total export shipments. Small quantities were shipped to 14 other countries.

The average value per ton of imported briquets was $15.68, and the

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total value of imports was $182,000. Briquets exported averaged $11.77 per ton, and the total value of exports was $210,000.

Import and export data are shown in tables 9 and 10. The data on exports reported by producers differ from those compiled from records of the Bureau of the Census because shipments made by export firms are not included in the producer reports.

**TABLE 9.—Fuel briquets (coal and coke) imported for consumption in the United States, by country and customs district**

| Country and customs district | 1962 | | 1963 | | 1964 | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| Canada: | | | | | | |
| Buffalo | 3,166 | $156,633 | 140 | $7,000 | | |
| Dakota | 1,101 | 40,614 | 1,289 | 18,957 | 5,867 | $89,607 |
| Duluth and Superior | 135 | 6,788 | | | | |
| Hawaii | 162 | 5,581 | 127 | 6,879 | | |
| Michigan | 1,006 | 57,698 | 36 | 1,687 | | |
| Montana and Idaho | 1,341 | 66,081 | 3,028 | 47,300 | 5,726 | 92,186 |
| Washington | 1,462 | 74,902 | | | | |
| Total | 8,373 | 408,297 | 4,620 | 81,823 | 11,593 | 181,793 |
| Japan: | | | | | | |
| Hawaii | 11 | 675 | | | | |
| San Francisco | 3 | 231 | | | | |
| Total | 14 | 906 | | | | |
| United Kingdom: Los Angeles | 9 | 597 | | | | |
| Grand total | 8,396 | 409,800 | 4,620 | 81,823 | 11,593 | 181,793 |

Source: Bureau of the Census.

**TABLE 10.—Fuel briquets (coal and coke) exported from the United States, by country of destination and customs district**

| | 1962 | | 1963 | | 1964 | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| Country or area: | | | | | | |
| North America: | | | | | | |
| Bahamas | | | 14 | $206 | | |
| Barbados | 16 | $232 | | | | |
| British Honduras | 18 | 270 | | | | |
| Canada | 17,028 | 213,314 | 9,062 | 125,257 | 15,911 | $182,992 |
| Costa Rica | 85 | 650 | | | | |
| Dominican Republic | 538 | 5,670 | 831 | 12,849 | 344 | 4,898 |
| Guatemala | | | | | 79 | 1,120 |
| Honduras | | | | | 22 | 302 |
| Jamaica | | | 14 | 200 | | |
| Leeward and Windward Islands | 19 | 232 | | | | |
| Mexico | 186 | 2,823 | 286 | 3,939 | 341 | 4,844 |
| Total | 17,890 | 223,191 | 10,207 | 142,451 | 16,697 | 194,156 |
| South America: | | | | | | |
| Brazil | | | | | 268 | 3,818 |
| Chile | | | | | 250 | 3,388 |
| Colombia | | | 608 | 8,594 | | |
| Paraguay | | | 69 | 976 | 74 | 970 |
| Surinam | 61 | 832 | | | | |
| Venezuela | 44 | 676 | 179 | 2,541 | 138 | 1,920 |
| Total | 105 | 1,508 | 856 | 12,111 | 730 | 10,096 |

See footnote at end of table.

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**TABLE 10.—Fuel briquets (coal and coke) exported from the United States, by country of destination and customs district—Continued**

| | 1962 | | 1963 | | 1964 | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| Country or area—Continued | | | | | | |
| Europe: | | | | | | |
| Germany, West | | | 425 | $6,000 | 57 | $800 |
| Spain | 123 | $1,841 | 45 | 640 | | |
| United Kingdom | | | | | 59 | 842 |
| Total | 123 | 1,841 | 470 | 6,640 | 116 | 1,642 |
| Asia: | | | | | | |
| India | | | | | 163 | 2,217 |
| Indonesia | | | | | 47 | 673 |
| Japan | | | (1) | (1) | | |
| Nansei and Nanpo Islands | 403 | 5,690 | | | | |
| Philippines | | | | | 64 | 898 |
| Saudi Arabia | 20 | 300 | 119 | 1,689 | | |
| Total | 423 | 5,990 | 119 | 1,689 | 274 | 3,788 |
| Africa: Western Equatorial Africa, n.e.c. | 55 | 426 | | | | |
| Oceania: | | | | | | |
| Australia | | | 728 | 43,973 | | |
| New Zealand | | | | | 40 | 564 |
| Total | | | 728 | 43,973 | 40 | 564 |
| Grand total | 18,596 | 232,956 | 12,380 | 206,864 | 17,857 | 210,246 |
| Customs district: | | | | | | |
| Buffalo | 1,433 | 19,366 | 400 | 6,070 | 1,450 | 21,580 |
| Chicago | 3,641 | 25,490 | | | | |
| Dakota | 3,622 | 51,676 | 1,762 | 25,870 | 1,211 | 18,964 |
| Duluth and Superior | 2,804 | 43,947 | 1,583 | 23,053 | 2,170 | 30,130 |
| El Paso | | | 67 | 836 | | |
| Florida | 35 | 464 | 28 | 406 | | |
| Galveston | | | 170 | 2,564 | | |
| Laredo | 169 | 2,563 | 156 | 2,203 | 169 | 2,404 |
| Los Angeles | | | 728 | 43,973 | | |
| Maryland | 61 | 832 | | | | |
| Michigan | 4,758 | 62,203 | 4,267 | 57,644 | 3,250 | 44,410 |
| Mobile | 538 | 5,670 | 661 | 10,285 | 344 | 4,998 |
| New Orleans | 103 | 920 | 69 | 976 | 175 | 2,392 |
| New York | 590 | 8,507 | 951 | 13,464 | 970 | 13,478 |
| Ohio | | | 425 | 6,000 | 7,600 | 64,916 |
| Philadelphia | 65 | 919 | | | 59 | 842 |
| Sabine | 55 | 426 | | | | |
| St. Lawrence | 606 | 8,066 | 1,050 | 12,620 | 287 | 3,892 |
| San Diego | 17 | 260 | 63 | 900 | 172 | 2,440 |
| Vermont | 45 | 873 | | | | |
| Washington | 54 | 774 | | | | |
| Total | 18,596 | 232,956 | 12,380 | 206,864 | 17,857 | 210,246 |

[1] Adjusted by Bureau of Mines to none.

Source: Bureau of the Census.

## TECHNOLOGY

A new process for producing smokeless briquets without binder by rapidly heating weakly coking or noncoking coals to 350°–500° C and then briquetting the char while still hot is described in British Patent Specification 964799.[2]

The Andre Dumont and Zolder Collieries in Belgium have developed a process for manufacturing briquets from high-volatile bituminous coal which are rendered smokeless by an appropriate thermic treat-

[2] British Coal Utilization Research Association. Monthly Bull., v. 28, No. 11, October-November, 1964, pt. 2, p. 445.

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ment. One plant, with an annual capacity of 200,000 tons of smokeless briquets having all the characteristics of an anthracite fuel, will be in operation by September 1965.[3]

British Patent Specification 947972 describes a method for preparing coal agglomerates resembling artificial anthracite. In the process, briquets are compacted from a paste consisting of fine coal particles, coal-tar pitch, sulfur, anthracene oil, and water. The paste is heated to 90°–100° C, pressed to form agglomerates, and then steadily heated in the absence of oxidizing agents to 700° C for a period of time varying from 1 hour 35 minutes for anthracite, to 5 hours 45 minutes for high-volatile bituminous coal.[4]

Recent studies conducted by the Bureau of Mines on an experimental blast furnace indicate that anthracite briquets can be used successfully to replace coke as metallurgical fuel for blast furnaces. Although tuyere pressures were somewhat higher and more erratic, and higher hot-blast temperatures were required to maintain the quality of the metal, fuel and production rates, and slag volumes, were comparable to those obtained for all-coke operations. The briquets used exhibited excellent mechanical strength and descended through the shaft of the blast furnace with little breakage or reduction in size.[5]

Extensive pilot-plant tests conducted by the Dravo Corp. have demonstrated that coal fines of widely varying size and moisture content can be pelletized for re-use as shipping coal or as feed for producing metallurgical coke in shaft furnaces, traveling grates, or circular furnaces. The tests revealed that, for most coal fines, the use of binders improved the strength of the pellets and assisted in the pelletizing process. The most satisfactory binder was found to be bentonite combined with a liquid lignosulphate.[6]

## PACKAGED FUEL

### CAPACITY

Productive capacity of this industry decreased about one-third in 1964 as operating plants declined from 13 to 9. Virtually all packaged-fuel plants are small. Eight had annual capacities of less than 15,000 tons, and only one had the capability of producing more than 25,000 tons.

As with briquet plants, all plants operated at reduced rates during the year, and the industry produced at only 11.9 percent of capacity.

### PRODUCTION

Although three small plants that were idle in 1963 reported production for 1964, seven other plants were idle or abandoned during the year, and output of the industry decreased about one-third. Of the plants active in both years, only one small plant reported an increase

[3] Deflandre, H. Smokeless Briquets from High-Volatile Bituminous Coal. Ann. Min. Belg., v. 6, June 1964, pp. 701–734; Fuel Abs. and Current Titles, (abs. 6561), v. 5, No. 10, October 1964.
[4] British Coal Utilization Research Association. Monthly Bull., v. 28, No. 4, April-May 1964, pt. 1, p. 184.
[5] Eckard, J. W., R. E. McKeever, W. S. Sanner, and P. L. Woolf. Anthracite Metallurgical Briquets as Blast-Furnace Fuel. BuMines Rept. of Inv. 6383, 1964, 16 pp.; Fuel Abs. and Current Titles, (abs. 510), v. 6, No. 1, January 1965, p. 113.
[6] Edwards, J. A. Pelletizing Coal Fines. Coll. Guard., v. 207, No. 5344, September 19, 1963, pp. 369–370.



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**TABLE 11.—Annual capacity and production of packaged-fuel plants in the United States**

| | Active plants | Annual capacity (short tons) | Production | |
|---|---|---|---|---|
| | | | Short tons | Percent of capacity |
| 1960 | 19 | 123,000 | 24,706 | 20.1 |
| 1961 | 16 | 114,300 | 19,180 | 16.8 |
| 1962 | 15 | 112,900 | 17,439 | 15.4 |
| 1963 | 13 | 113,300 | 14,215 | 12.5 |
| 1964: | | | | |
| Plants with capacity of— | | | | |
| Less than 5,000 tons | 6 | 8,400 | 1,573 | 18.7 |
| 5,000 to less than 10,000 tons | 1 | [1] 69,800 | [1] 7,749 | 11.1 |
| 10,000 to less than 15,000 tons | 1 | | | |
| 15,000 to less than 25,000 tons | | | | |
| 25,000 or more tons | 1 | | | |
| Total | 9 | 78,200 | 9,322 | 11.9 |
| Plants with production of— | | | | |
| Less than 1,000 tons | 7 | 78,200 | 9,322 | 11.9 |
| 1,000 to less than 3,000 tons | 1 | [2] | [2] | [2] |
| 3,000 to less than 5,000 tons | | | | |
| 5,000 or more tons | 1 | [2] | [2] | [2] |
| Total | 9 | 78,200 | 9,322 | 11.9 |

[1] Combined to avoid disclosing individual company data.
[2] Included with "Less than 1,000 tons" to avoid disclosing individual company data.

of production in 1964. Seven of the active plants produced less than 1,000 tons.

Packaged fuel was produced in six States. Michigan had 70 percent of the total output, and Indiana and Ohio, virtually all of the remainder.

Production, which was seasonal, ranged from 7 tons in July to 1,705 tons in January. Total output was slightly less than the combined total of fuels and binders because of breakage and other minor losses.

The quantities of packaged fuel produced by States and months are shown in tables 12 and 13.

## RAW MATERIALS

**Fuels.**—Most of the packaged fuel was manufactured from bituminous coals. One plant, however, used petroleum coke in addition to bituminous coal.

Three plants used yard screenings exclusively, three used raw fuels purchased from other sources, and three used both types. Yard screenings accounted for only 9 percent of the total raw fuels because the larger plants used purchased coals, obtained chiefly from docks and other unloading points.

The average value per ton of all raw fuels consumed was $9.48, an increase of 1 percent over the average value of fuels consumed in 1963.

**Binders.**—All plants used starch for binder, with the exception of one small plant that used corn syrup. Excluding water, binders constituted 0.6 percent of the total raw materials. This was an average of 12.2 pounds of binder consumed for each ton of raw fuel processed.

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**TABLE 12.—Production and shipments of packaged fuel in the United States, by State**

| State | Active plants | Production (short tons) | Shipments | | |
|---|---|---|---|---|---|
| | | | Short tons | Value | |
| | | | | Total | Average |
| 1963: | | | | | |
| Indiana | 2 | (1) | (1) | (1) | (1) |
| Michigan | 4 | 7,998 | 8,342 | $200,046 | $23.98 |
| Ohio | 4 | 1,080 | 1,068 | 23,482 | 21.99 |
| Other States [2] | 3 | 5,137 | 5,145 | 116,493 | 22.64 |
| Total | 13 | 14,215 | 14,555 | 340,021 | 23.36 |
| 1964: | | | | | |
| Indiana | 2 | (1) | (1) | (1) | (1) |
| Michigan | 3 | 6,518 | 7,125 | 179,748 | 25.23 |
| Ohio | 1 | (1) | (1) | (1) | (1) |
| Other States [2] | 3 | 2,804 | 2,830 | 61,714 | 21.81 |
| Total | 9 | 9,322 | 9,955 | 241,462 | 24.26 |

[1] Included with "Other States" to avoid disclosing individual company data.
[2] Illinois, Virginia, Wisconsin.

**TABLE 13.—Production of packaged fuel in the United States in 1964, by month**

| Month | Short tons | Month | Short tons | Month | Short tons |
|---|---|---|---|---|---|
| January | 1,705 | May | 10 | September | 626 |
| February | 1,129 | June | | October | 1,177 |
| March | 1,354 | July | 7 | November | 913 |
| April | 645 | August | 518 | December | 1,238 |

Binders consumed averaged $118.53 per ton, and their total value was $6,756. This was about 7 percent of the total value of the raw fuels and binders consumed.

Table 14 shows the quantities and values of raw materials consumed in 1964.

## SHIPMENTS

Packaged fuel was sold principally in the areas of production, and all shipments were by truck. In some instances, packaged fuel was sold directly to consumers at the plant where it was manufactured. Sales were about 7 percent greater than production because two plants sold packaged fuel that was on hand from the previous year.

## VALUE AND PRICE

The average value per ton, f.o.b. plant, of all packaged fuel distributed in 1964 was $24.26, an increase of 4 percent over the average value in 1963. However, the total value of shipments declined nearly one-third because of the substantial decrease in the quantity of packaged fuel shipped.

The average plant price of packaged fuel was $7.79 greater than the f.o.b. plant value of fuel briquets, but the values are not com-

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**TABLE 14.—Quantity and value of raw materials used in making packaged fuel in the United States in 1964, by State**

| State | Short tons | Value | |
|---|---|---|---|
| | | Total | Average |
| Fuels: | | | |
| Michigan | 6,518 | $59,504 | $9.13 |
| Other States [1] | 2,792 | 28,799 | 10.31 |
| Total | 9,310 | 88,303 | 9.48 |
| Binders: | | | |
| Michigan | 35 | 4,003 | 114.37 |
| Other States [1] | 22 | 2,753 | 125.14 |
| Total | 57 | 6,756 | 118.53 |
| Fuels and binders: | | | |
| Michigan | 6,553 | 63,507 | 9.69 |
| Other States [1] | 2,814 | 31,552 | 11.21 |
| Grand total | 9,367 | 95,059 | 10.15 |

[1] Illinois, Indiana, Minnesota, Ohio, Virginia.

parable because the products and methods in which they are marketed are different. Because most briquets were sold in bulk for residential heating, their prices were largely competitive with other quality bulk solid fuels. Also, briquets were sold principally through wholesale and retail channels, and the actual price to the consumer was substantially greater than the f.o.b. plant value. Packaged fuel, however, is a specialty item, sold mostly in small quantities directly to the consumer by the producer; the f.o.b. plant value generally is equivalent to the retail price. The values of packaged fuel shipments in 1964 are shown in table 12.

## WORLD REVIEW

World production of fuel briquets and other briquetted fossil fuels was estimated at 130 million short tons in 1964, a 3-percent decrease below the production in 1963 but 11 percent more than the average amount produced annually in 1957–59. Most of the decrease in 1964 was attributed to smaller outputs in Europe, chiefly in Belgium, France, and West Germany.

Virtually all European countries produced briquets, and Europe's output was 91 percent of the world total. East Germany, the largest producer, manufactured 56 percent of Europe's output and 52 percent

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of the world total. Virtually all briquets produced in East Germany were made from lignite. These briquets, which made up a substantial part of East Germany's total fuel requirement, were used extensively for residential and industrial heating; some briquets were carbonized for use in metallurgical applications.

West Germany ranked second in output with 18 percent of the world total. About three-fourths of the West German production was manufactured from lignite; the remainder was from bituminous coal and anthracite. Briquets in West Germany were used principally as household fuel, but substantial quantities were used also as industrial fuel. West Germany exported nearly 10 percent of its output.

Ranking third in world production, the U.S.S.R. had an estimated 7 percent of the world briquet output. Data were not available on the quantities of different fuels briquetted in the U.S.S.R., but, in addition to briquets manufactured from bituminous coal and anthracite, large quantities also were produced from peat. As in other European countries, briquets were used principally for domestic heating and as industrial fuel in the Soviet Union.

France has fourth in world production with 6 percent of the total. French briquets, manufactured principally from bituminous coal, also were used chiefly as domestic and industrial fuel. France also imported more than 1 million tons of briquets, principally from Belgium, the Netherlands, and West Germany.

Other European countries with substantial production were Belgium, Bulgaria, Hungary, the Netherlands, Poland, Spain, and the United Kingdom. All produced more than 1 million tons, and their combined output was 8 percent of the world total.

Seven percent of all briquets were produced in Asia, chiefly in Japan and the Republic of Korea. Both countries used large quantities of briquets for domestic heating and cooking. About one-half of Japan's output was produced from anthracite or an anthracite-coke mixture, and the remainder, known as pitch briquets, from bituminous coal. Anthracite briquets were used principally for domestic fuel, and pitch briquets were used for railway fuel.

Australia ranked eighth in world output. Australia's production also was consumed chiefly for domestic fuel and as fuel for light industries.

The United States, with 0.3 percent of the world production, ranked 16th in output.

Production, by countries, is shown in table 15.

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**TABLE 15.—World production of fuel briquets and packaged fuel, by country[1]**

(Thousand short tons)

| Country | 1960 | 1961 | 1962 | 1963 | 1964[p] |
|---|---|---|---|---|---|
| North America: | | | | | |
| Canada | 81 | 67 | 56 | 72 | e 65 |
| United States: | | | | | |
| Briquets | 744 | 572 | 570 | 551 | 359 |
| Packaged fuel | 25 | 19 | 17 | 14 | 9 |
| Total | 850 | 658 | 643 | 637 | 433 |
| Europe: | | | | | |
| Belgium | 1,190 | 1,290 | 1,756 | 2,534 | e 1,650 |
| Bulgaria e | 275 | 440 | 1,100 | 1,380 | 1,700 |
| Czechoslovakia: | | | | | |
| Bituminous | 360 | 166 | | | |
| Lignite | 481 | 793 | 868 | 858 | e 880 |
| Denmark | 53 | 62 | 61 | e 55 | e 55 |
| Finland | 12 | 10 | 7 | 20 | e 15 |
| France | 6,693 | 6,714 | 7,660 | 8,834 | 7,330 |
| Germany: | | | | | |
| East, Lignite | 61,781 | 63,930 | 65,838 | 66,421 | e 67,000 |
| West: | | | | | |
| Anthracite and bituminous | 5,753 | 5,367 | 6,242 | 7,003 | 5,962 |
| Lignite | 16,805 | 17,102 | 17,383 | 17,454 | 16,927 |
| Greece | 97 | 73 | 89 | 155 | e 100 |
| Hungary | 1,171 | 1,254 | 1,311 | 1,360 | e 1,380 |
| Ireland [2] | 137 | 233 | 266 | 323 | 316 |
| Italy, Anthracite | 30 | 32 | 65 | 141 | e 75 |
| Netherlands: | | | | | |
| Anthracite and bituminous | 1,302 | 1,310 | 1,379 | 1,721 | 1,495 |
| Lignite | 69 | 82 | 78 | 69 | 73 |
| Poland: | | | | | |
| Bituminous | 791 | 744 | 721 | 704 | e 660 |
| Lignite | 345 | 373 | 380 | 392 | e 350 |
| Portugal | 45 | 42 | 50 | 46 | 42 |
| Rumania e | 330 | 330 | 330 | 330 | 330 |
| Spain | 1,260 | 1,232 | 1,364 | 1,316 | 1,145 |
| Sweden | 60 | 68 | 47 | e 65 | e 45 |
| U.S.S.R.e | 9,400 | 9,400 | 9,400 | 9,400 | 9,600 |
| United Kingdom | 1,582 | 1,645 | 1,734 | 1,851 | 1,489 |
| Yugoslavia | 10 | 6 | 3 | 18 | e 7 |
| Total | 110,000 | 112,700 | 118,100 | 122,450 | 118,700 |
| Asia: | | | | | |
| Afghanistan | e 22 | 21 | e 21 | e 22 | e 22 |
| Indonesia e | 11 | 11 | 11 | 11 | 11 |
| Japan | e 3,200 | 4,529 | 4,605 | 4,740 | 4,500 |
| Korea, Republic of | 3,206 | e 4,400 | 5,460 | 3,805 | e 3,900 |
| Pakistan e | 17 | 22 | 22 | 22 | 22 |
| Turkey | 165 | 74 | 17 | e 17 | 62 |
| Viet-Nam, South e | 61 | 61 | 61 | 61 | 61 |
| Total | 6,700 | 9,100 | 10,200 | 8,700 | 8,600 |
| Africa: | | | | | |
| Algeria | 50 | 45 | e 18 | | |
| Morocco | 25 | 26 | 25 | 20 | 20 |
| Tunisia e | 6 | 7 | 8 | 8 | 8 |
| Total | 81 | 78 | 51 | 28 | 28 |
| Oceania: | | | | | |
| Australia | 1,694 | 2,062 | 2,002 | 2,113 | 2,078 |
| New Zealand | 17 | 17 | 13 | 12 | e 13 |
| Total | 1,711 | 2,079 | 2,015 | 2,125 | 2,091 |
| World total (estimate) | 119,300 | 124,600 | 131,000 | 133,900 | 129,900 |

e Estimated. p Preliminary.

[1] Includes briquets made from coal, lignite, and peat and revisions of data published previously. Data do not add to totals shown owing to rounding.

[2] Year ended Mar. 31 of year following that stated.

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# Peat

By Eugene T. Sheridan[1]

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## GENERAL SUMMARY

PEAT PRODUCTION continued to increase in 1964, and output reached 648,708 short tons. This was a 12-percent increase over 1963 production and the largest output reported to date.

There were 141 active commercial operations in 26 States. Michigan was the leading producer, with 41 percent of the total production and about one-fifth of the active plants. Indiana, Pennsylvania, California, Washington, and New York ranked next in output in the order named. These States and Michigan produced nearly three-fourths of the total peat in 1964.

Fifty-six percent of the output was reed-sedge peat. The remaining production was divided about equally between moss peat and humus. Fourteen percent was sold as excavated, and the remainder was processed by shredding or pulverizing, screening, and, in a few instances, thermal drying.

Virtually all peat was sold for agricultural and horticultural applications. Of the total domestic peat distributed by producers, 96 percent was sold for general soil-improvement use. The remainder was sold principally for use in potting soils, for packing flowers and shrubs, and in mixed fertilizers. No peat was reported sold for use as fuel.

Forty-eight percent of the domestic peat was sold in bulk, and the balance was sold in packages. Peat was sold in bulk in all producing States except Maine; producers in 19 States sold peat in packages.

The value of commercial sales by producers was $6.2 million. The average value per ton of all peat sold was $9.67.

Imports increased 3 percent because of increased shipments from Canada. Imports from Europe declined.

World production was estimated at 183 million short tons. The U.S.S.R. was the largest producer, with an estimated 96 percent of the total output.

[1] Mineral specialist, Division of Bituminous Coal.



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Salient statistics are shown in table 1. Figure 1 shows data on production, imports, and available supply.

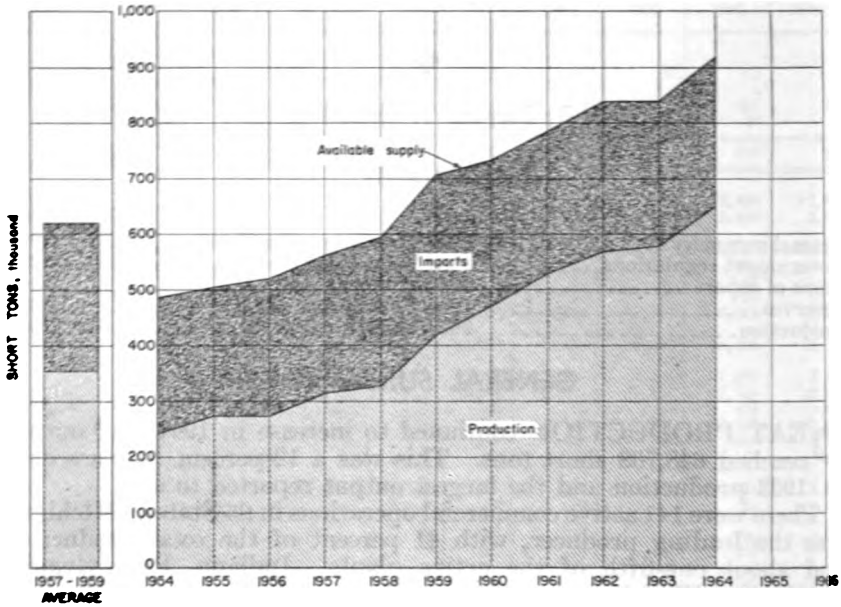


FIGURE 1.—Production, imports, and available supply of peat in the United States, 1954–64.

TABLE 1.—Salient peat statistics

| | 1957–59 (average) | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| United States: | | | | | |
| Number of operations | 87 | 128 | 117 | 113 | 141 |
| Production.....short tons | 354, 497 | 531, 067 | 571, 873 | 578, 530 | 648, 708 |
| Commercial sales.....do | 342, 711 | 492, 798 | 566, 441 | 546, 521 | 639, 365 |
| Values of sales | $3, 556, 218 | $4, 672, 933 | $5, 185, 627 | $5, 422, 877 | $6, 181, 341 |
| Average per ton | $10. 38 | $9. 48 | $9. 15 | $9. 92 | $9. 67 |
| Imports.....short tons | 267, 525 | 252, 437 | 267, 678 | 261, 331 | 270, 419 |
| Available for consumption [1].....do | 610, 236 | 745, 235 | 834, 119 | 807, 952 | 909, 784 |
| World production.....do | [2] 71, 100, 000 | [3] 165, 800, 000 | [3] 144, 400, 000 | [3] 171, 200, 000 | 183, 400, 000 |

[1] Commercial sales plus imports.
[2] In addition, the U.S.S.R. produced an undetermined quantity of agricultural peat.
[3] Revised figure.

## GOVERNMENT REGULATIONS

There are no national standards in the United States for differentiating among peats according to their various chemical and physical characteristics and suitability for different uses. The sale of peat, however, is governed by trade regulations, established by the Federal Trade Commission, to promote fair labeling and selling practices. In general, the regulations forbid unfair or deceptive practices in marketing, misrepresentations, and the use of deceptive trade or corporate names. They also state the requirements for labeling a product

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"peat" and the manner in which the terms "peat moss" and "moss peat" may be used. According to the regulations, peat is any partially decomposed plant matter that has accumulated under water or in a water-saturated environment. It is unlawful to designate a product "peat" unless 75 percent of the material, by dryweight, is composed of peat, as defined previously, and the remainder consists of normally associated soil materials. A product labeled "moss peat" must conform to this definition, and the peat must have been formed from sphagnum, hypnum, or other mosses. The use of the term "peat moss," a misnomer generally applied to all types of peat, is subject to the requirements for "moss peat" except when the kind or kinds of peat of which the product is composed are conspicuously stated in immediate conjunction with the term "peat moss."

The trade practice rules also prohibit discriminatory practices in pricing, grants for services or facilities, and advertising or promotional allowances. To further protect the public and assist consumers in using the various kinds of peat, the rules recommend that producers furnish such information as degree of acidity, ash content, moisture-holding capacity, and degree of decomposition of the peat. They also recommend that peat be sold on a dry-measure basis and that information be furnished on the principal uses for which the product is suitable.

Government purchases of peat are subject to Federal specifications, developed by the Federal Supply Service, General Services Administration. The current specification, Q–P–166e, May 10, 1961, classifies and lists the requirements for four types of peat: (1) Sphagnum-moss peat; (2) other moss peats; (3) humus peat; and (4) reed-sedge peat. The Federal Supply Service also supplies information on sampling, inspection, and testing procedures and outlines the requirements for packaging and marking containers.

## SCOPE OF REPORT

This chapter, except where noted, is based upon data submitted voluntarily by producers of peat in the United States. Similar reports on the peat industry have been published each year since 1934 when the Bureau of Mines resumed the industry survey conducted from 1908 to 1926 by the U.S. Geological Survey. No data were collected or published by either agency between 1926 and 1934.

Complete coverage of the industry was attempted, and all reported production was included. No estimates were made for nonreporting companies, which were assumed to have been idle or not commercial producers. Questionnaires were mailed to all companies that reported commercial production within the past 3 years and to companies that were reported as possible peat producers. Because of the nature of the industry, this survey may have failed to reach all producers. However, all major and most of the smaller producers were canvassed, and the data include virtually all peat produced in the United States for commercial sale.

The survey revealed that there were 141 active and 26 idle peat operations in 1964. Of the other plants canvassed, 15 were abandoned and 14 did not respond. Two plants produced peat in 1964 but had no commercial sales.

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Peat is classified in this report as moss peat, reed-sedge peat, and humus. The first two types are classified according to botanical origin; the last type is classified according to degree of decomposition. Moss peat is a type that has formed predominantly from sphagnum, hypnum, or other mosses, whereas reed-sedge peat has originated principally from reeds, sedges, and associated swamp plants. Plant remains in both the moss and reed-sedge types are identifiable, but reed-sedge peat usually is more decomposed. Humus includes all peat so decomposed that its biological identity cannot be determined. These classifications are less restrictive than those of the Federal specifications governing purchases of peat by the Federal Government, but the nature of the domestic peat industry makes it impractical to make them more limiting, particularly for reporting purposes.

Unprepared peat had no processing other than air drying. Processed peat was shredded, screened, and, in some instances, artificially dried. Cultivating refers to the operation of aerating peat before excavating it by turning over the surface layer of the deposit with a disk or spike harrow.

Data were requested on production, sales, values, uses, location and size of deposits, and types of equipment used. Data shown on uses include peat produced in the United States only, because no information was available on the ultimate uses of imported peat.

All values for domestic peat were based upon producers' selling prices at the plant. In general, the prices did not include the cost of containers, but this cost may have been included by some producers. Values not reported by producers were estimated by using the values of similar types reported by other producers within the State.

All quantities are shown in short tons of 2,000 pounds.

## RESERVES

The known reserves of peat in the United States are estimated at approximately 14 billion air-dried short tons. These resources are widely distributed, and deposits occur in 34 States. Approximately nine-tenths of the total, however, are in four States—Florida, Michigan, Minnesota, and Wisconsin.

Major peat deposits occur in two general geographic areas. The northern region (with about 80 percent of the total reserves) covers, roughly, the area north of the 41st parallel and east of the 97th meridian. It includes all of the New England States, Illinois, Indiana, Iowa, Michigan, Minnesota, New Jersey, New York, Ohio, Pennsylvania, and Wisconsin. The Atlantic coast region, with most of the remaining reserves, includes all of Florida and the coastal areas of all States south of New Jersey that border the Atlantic Ocean.

In the northern region, peat has accumulated chiefly in former lakes, marshes, and ponds, and the deposits are classified as the filled-basin type. They consist of partially decomposed peat, formed principally from reeds, sedges, grasses, or other swamp plants, underlain by a layer of well-decomposed peat that formed from algae and other simple plants when the basin was first established. In many areas these deposits are covered with a layer of "built-up" peat, formed principally from mosses and shrubs that grew on the surface of the deposit after the basin was filled to the level of the surrounding

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countryside. In most areas this stratum of moss peat is quite thin. In others, however, where drainage was poor, many feet of moss peat have accumulated. In a few of the northern areas, particularly Maine, there are large deposits of built-up peat, formed from the accumulation of mosses and shrubs on flat or gently sloping surfaces.

The Atlantic coast region is characterized by many salt- and fresh-water marshes and swamps, and peat deposits occur principally in valleys and lagoons that were formed by the gradual subsidence of the coastal plain. This peat has formed principally from salt-marsh grasses and other salt-water plants; however, many deposits also have an underlayer of peat formed from fresh-water plants that were deposited before the coast subsided. Deciduous and coniferous trees also have contributed to peat formation in many areas in this region.

Approximately 75 percent of the total U.S. reserves are in three northern States—Minnesota, Wisconsin, and Michigan. Deposits occur in most areas of all three States; the bulk of the peat, however, is found north of the 45th parallel. This region is characterized by relatively low temperatures and high humidity which are conducive to peat formation.

Minnesota's reserves, estimated at 6.8 billion tons, are the largest in the United States. Peat deposits are in virtually all areas of Minnesota, but more than three-fourths of the total reserves are in four northern counties.

Wisconsin has about 1 million acres of peatlands, and reserves are estimated at 2.5 billion tons. As in Minnesota, these reserves are scattered widely, but the most extensive deposits are in the northern part of the State.

Michigan's reserves are estimated at 1 billion tons. Deposists are well distributed throughout the State, but the largest and most extensive are in the north where some bogs exceed 25 square miles in area and are 2 to 20 feet deep. There are many smaller deposits in central and southern Michigan.

Peat occurs in all New England States, but four-fifths of the New England reserves are in Maine. Maine's reserves are estimated at 100 million tons, of which about one-half are in the coastal areas and near the lower courses of major streams. The remainder is in heavily forested areas in the northern and western parts of the State and is therefore relatively inaccessible.

All States along the Atlantic coast have peat deposits, but about 75 percent of the estimated 2.7 billion tons of the Atlantic coastal region is in Florida. Peat occurs in virtually all parts of Florida, which ranks third in total U.S. reserves. The Dismal Swamp in Virginia and North Carolina is the second largest peat area of the Atlantic coast region.

There are small deposits of peat also in the coastal areas of Alabama, Louisiana, Mississippi, and Texas; on the west coast in California, Oregon, and Washington; and in Colorado, Idaho, and Montana. Less than 1 percent of the total U.S. reserves are in these States.

Known original reserves of peat in the United States, as reported by the U.S. Geological Survey in 1922, are shown in table 2. The reserves remain virtually intact because only 6.9 million tons, or less than 0.05 percent of the estimated total, has been extracted for commercial sale.

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**TABLE 2.—Known original reserves of peat in the United States, estimated on an air-dried basis, by region and State [1]**

(Thousand short tons)

| Region and State | Reserves | Region and State | Reserves |
|---|---|---|---|
| Northern region: | | Atlantic coast region: | |
| Minnesota | 6,835,000 | Virginia and North Carolina | 700,000 |
| Wisconsin | 2,500,000 | Florida | 2,000,000 |
| Michigan | 1,000,000 | Other States [2] | 2,000 |
| Iowa | 22,000 | | |
| Illinois | 10,000 | Total | 2,702,000 |
| Indiana | 13,000 | | |
| Ohio | 50,000 | Other regions: | |
| Pennsylvania | 1,000 | Gulf coast [3] | 2,000 |
| New York | 480,000 | California | 72,000 |
| New Jersey | 15,000 | Oregon and Washington | 1,000 |
| Maine | 100,000 | | |
| New Hampshire | 1,000 | Total | 75,000 |
| Vermont | 8,000 | | |
| Massachusetts | 12,000 | | |
| Connecticut | 2,000 | | |
| Rhode Island | 1,000 | | |
| Total | 11,050,000 | Total all regions | 13,827,000 |

[1] U.S. Geological Survey, Coal Resources of the United States (Progress Report): Circ. 293, Oct. 1, 1953, p. 38.
[2] Includes Delaware, Maryland, South Carolina, and Georgia.
[3] Excludes Florida.

## PRODUCTION

Peat production reached 648,708 tons in 1964, a 12-percent increase over output in 1963 and 83 percent more peat than the average quantity produced annually in 1957–59. This increase can be attributed principally to an increased demand for domestic peat as total peat consumption increased in 1964 and imports supplied a smaller percentage of the total.

There were 141 active operations, 28 more than the number that reported production in 1963. Michigan, with 29, had the largest number, followed by Washington with 15, Colorado with 14, and Pennsylvania with 10 operations. These four States had nearly one-half of the total number of operations.

Most peat operations were small. Approximately three-fourths of the active plants had outputs of less than 5,000 tons. Only five plants produced more than 25,000 tons. These five plants, however, accounted for nearly one-third of the total output.

Michigan, with 41 percent of the total output, was also the largest producer. Indiana, Pennsylvania, California, Washington, and New York followed in output in the order named.

More than one-half of the production was reed-sedge peat, which was produced principally in Michigan. However, all producing States except Alaska, Georgia, Maine, and Wisconsin also produced this type. Fifty-five percent of the total peat was cultivated before it was extracted, and 86 percent was subjected to some form of processing before it was sold.

Production methods varied, but virtually all peat was excavated with some type of machinery. Most of the equipment consisted of conventional excavating and earth-moving machines, including power shovels, clamshells, draglines, dredges, bulldozers, front-end loaders, and belt and bucket loaders. The most widely used machine was the

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front-end loader; next in popularity was the bulldozer. Processing machinery included a variety of shredders, grinders, pulverizers, hammermills, screens, and rotary dryers.

Table 4 shows production, commercial sales, and the number of active plants in each State.

**TABLE 3.—Peat produced in the United States in 1964, by kind**

(Short tons)

| Kind | Total | Unprepared | Processed | |
|---|---|---|---|---|
| | | | Shredded | Shredded and kiln-dried |
| Moss | 144,899 | 11,952 | 111,958 | 20,989 |
| Reed-sedge | 360,700 | 21,065 | 336,548 | 3,087 |
| Humus | 143,109 | 59,897 | 79,942 | 3,270 |
| Total | 648,708 | 92,914 | 528,448 | 27,346 |

**TABLE 4.—Production and commercial sales of peat in the United States, by State**

| State | Active plants | Production (short tons) | Commercial sales | | |
|---|---|---|---|---|---|
| | | | Short tons | Value | |
| | | | | Total | Average |
| 1963: | | | | | |
| California | 5 | 43,873 | 39,873 | $450,193 | $11.29 |
| Colorado | 5 | 13,774 | 13,774 | 97,724 | 7.09 |
| Connecticut, Maine, Massachusetts | 5 | 4,941 | 4,441 | 58,933 | 13.27 |
| Florida | 7 | 22,143 | 21,049 | 129,380 | 6.15 |
| Georgia, Maryland, South Carolina | 5 | 11,642 | 10,998 | 112,640 | 10.24 |
| Idaho, Montana, North Dakota | 3 | 2,070 | 1,320 | 24,550 | 18.60 |
| Illinois and Iowa | 4 | 21,732 | 21,732 | 239,939 | 11.04 |
| Indiana | 6 | 55,745 | 47,695 | 411,848 | 8.64 |
| Michigan | 28 | 255,859 | 251,809 | 2,412,995 | 9.58 |
| Minnesota | 6 | 8,373 | 8,110 | 294,373 | 36.30 |
| New Jersey | 3 | 23,685 | 23,685 | 241,042 | 10.18 |
| New York | 5 | 21,358 | 21,358 | 177,664 | 8.32 |
| Ohio | 10 | 7,110 | 6,910 | 108,876 | 15.76 |
| Pennsylvania | 7 | 44,910 | 33,952 | 338,667 | 9.97 |
| Washington | 11 | 38,648 | 37,248 | 187,549 | 5.04 |
| Wisconsin | 3 | 2,667 | 2,667 | 136,504 | 51.18 |
| Total | 113 | 578,530 | 546,621 | 5,422,877 | 9.92 |
| 1964: | | | | | |
| Alaska | 1 | 2,350 | 2,350 | 18,800 | 8.00 |
| California | 5 | 35,391 | 35,391 | 442,941 | 12.52 |
| Colorado | 14 | 27,931 | 27,931 | 187,864 | 6.73 |
| Connecticut, Massachusetts, New Jersey | 5 | 22,431 | 22,431 | 254,334 | 11.34 |
| Florida | 7 | 19,813 | 19,813 | 102,152 | 5.16 |
| Georgia, Maryland, South Carolina | 5 | 16,101 | 14,624 | 151,075 | 10.33 |
| Idaho | 2 | 6,900 | 900 | 8,000 | 8.89 |
| Illinois and Iowa | 7 | 36,843 | 36,843 | 420,272 | 11.41 |
| Indiana | 8 | 66,548 | 66,568 | 543,046 | 8.16 |
| Maine | 3 | 6,300 | 6,350 | 170,750 | 26.89 |
| Michigan | 29 | 268,913 | 269,074 | 2,412,274 | 8.97 |
| Minnesota | 8 | 17,552 | 19,188 | 405,333 | 21.12 |
| Montana, Nevada, North Dakota | 3 | 309 | 309 | 11,896 | 38.50 |
| New York | 5 | 32,574 | 32,574 | 261,366 | 8.02 |
| Ohio | 8 | 6,636 | 6,363 | 82,608 | 12.98 |
| Pennsylvania | 10 | 43,500 | 39,500 | 397,123 | 10.05 |
| Vermont | 3 | 303 | 286 | 4,492 | 15.71 |
| Washington | 15 | 35,017 | 35,609 | 170,497 | 4.79 |
| Wisconsin | 3 | 3,296 | 3,261 | 136,518 | 41.86 |
| Total | 141 | 648,708 | 639,365 | 6,181,341 | 9.67 |

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TABLE 5.—Relative size of peat operations in the United States

| Size | Active plants | | Production | |
|---|---|---|---|---|
| | Number | Percent of total | Short tons | Percent of total |
| 1963: | | | | |
| Less than 500 tons | 25 | 22.1 | 5,062 | 0.9 |
| 500 to less than 1,000 tons | 18 | 15.9 | 12,678 | 2.2 |
| 1,000 to less than 5,000 tons | 44 | 39.0 | 106,552 | 18.7 |
| 5,000 to less than 15,000 tons | 16 | 14.2 | 123,816 | 21.4 |
| 15,000 to less than 25,000 tons | 5 | 4.4 | 88,484 | 15.3 |
| 25,000 or more tons | 5 | 4.4 | 239,938 | 41.5 |
| Total | 113 | 100.0 | 578,530 | 100.0 |
| 1964: | | | | |
| Less than 500 tons | 35 | 24.8 | 8,399 | 1.3 |
| 500 to less than 1,000 tons | 20 | 14.2 | 15,534 | 2.5 |
| 1,000 to less than 5,000 tons | 54 | 38.3 | 134,517 | 20.7 |
| 5,000 to less than 15,000 tons | 20 | 14.2 | 162,397 | 25.0 |
| 15,000 to less than 25,000 tons | 7 | 5.0 | 117,416 | 18.1 |
| 25,000 or more tons | 5 | 3.5 | 210,145 | 32.4 |
| Total | 141 | 100.0 | 648,708 | 100.0 |

## CONSUMPTION AND USES

Both imports and sales of domestic peat increased and more than 100,000 additional tons of peat was consumed or was available for consumption in 1964 than in 1963. This was a 13-percent increase over the quantity placed on the market in the preceding year.

Sales for general soil improvement accounted for 96 percent of the peat marketed by domestic producers. This peat was sold principally to nurseries and greenhouses for use in growing plants, trees, and shrubs; to landscape gardeners and contractors for building lawns and golf course greens and for transplanting trees and shrubs; and to garden, chain, and variety stores that sold peat to homeowners for mulching and improving lawn and garden soils. Two percent of the total was sold for use in potting soils and seed inoculant, and the remainder, for packing flowers and shrubs, and for use in mixed fertilizers, mushroom beds, and earthworm culture. No peat was reported sold for fuel or energy purposes.

Fifty-two percent of all peat sold was packaged. Sales of packaged peat in 1964 increased 21 percent over the preceding year and were more than three times greater than the 1957–59 average quantity sold in packages. The sharp increase in packaged sales in recent years has resulted from the development of synthetic films from which relatively inexpensive moistureproof bags are manufactured. These containers have enabled producers to distribute peat on a national basis, whereas only a few years ago it was uneconomical to ship peat from the producing area. Most packaged domestic peat was sold by weight in packages of 25, 50, and 100 pounds.

Bulk and packaged commercial sales, by kind and use, are shown in tables 6 and 7.

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**TABLE 6.—Commercial sales of peat in the United States in 1964, by kind and use**

| Use | Moss | | | Reed-sedge | | | Humus | | |
|---|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | | Short tons | Value | |
| | | Total | Average | | Total | Average | | Total | Average |
| Bulk: | | | | | | | | | |
| Soil improvement | 77,574 | $559,157 | $7.21 | 107,850 | $865,617 | $8.03 | 99,539 | $577,880 | $5.81 |
| Other uses | 1,910 | 16,700 | 8.74 | 3,885 | 42,668 | 10.98 | 13,308 | 79,501 | 5.97 |
| Total | 79,484 | 575,857 | 7.24 | 111,735 | 908,285 | 8.13 | 112,847 | 657,381 | 5.83 |
| Packaged: | | | | | | | | | |
| Soil improvement | 65,449 | 1,230,653 | 18.80 | 240,060 | 2,234,778 | 9.31 | 21,051 | 85,322 | 4.05 |
| Other uses | 97 | 4,035 | 41.60 | 6,712 | 325,045 | 48.43 | 1,930 | 159,985 | 82.89 |
| Total | 65,546 | 1,234,688 | 18.84 | 246,772 | 2,559,823 | 10.37 | 22,981 | 245,307 | 10.67 |
| Total: | | | | | | | | | |
| Soil improvement | 143,023 | 1,789,810 | 12.51 | 347,910 | 3,100,395 | 8.91 | 120,590 | 663,202 | 5.50 |
| Other uses | 2,007 | 20,735 | 10.33 | 10,597 | 367,713 | 34.70 | 15,238 | 239,486 | 15.72 |
| Grand total | 145,030 | 1,810,545 | 12.48 | 358,507 | 3,468,108 | 9.67 | 135,828 | 902,688 | 6.65 |

**TABLE 7.—Commercial sales of peat in the United States in 1964, by use**

| Use | In bulk | | | In packages | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Short tons | Value | | Short tons | Value | | Short tons | Value | |
| | | Total | Average | | Total | Average | | Total | Average |
| Soil improvement | 284,963 | $2,002,654 | $7.03 | 326,560 | $3,550,753 | $10.87 | 611,523 | $5,553,407 | $9.08 |
| Potting soils [1] | 6,684 | 43,192 | 6.46 | 6,536 | 450,068 | 68.86 | 13,220 | 493,260 | 37.31 |
| Packing flowers, shrubs, etc | 4,352 | 40,092 | 9.21 | 2,203 | 38,997 | 17.70 | 6,555 | 79,089 | 12.07 |
| Mushroom beds [2] | 1,649 | 16,208 | 9.83 | ------ | ------ | ------ | 1,649 | 16,208 | 9.83 |
| In mixed fertilizers | 6,418 | 39,377 | 6.14 | ------ | ------ | ------ | 6,418 | 39,377 | 6.14 |
| Total | 304,066 | 2,141,523 | 7.04 | 335,299 | 4,039,818 | 12.05 | 639,365 | 6,181,341 | 9.67 |

[1] Includes small amount sold for seed inoculant.
[2] Includes small amount sold for earthworm culture and other uses.

## VALUE AND PRICE

The total value, f.o.b. plant, of all domestic peat sold in 1964 was $6.2 million, an increase of 14 percent over the total value of sales in 1963 and the highest value reported to date. The average value per ton for all peat sold in 1964, however, decreased $0.25 to $9.67.

Average prices of various kinds of peat varied greatly, as selling prices at individual plants were based principally upon the kind of peat sold, the amount of processing to which the peat was subjected, and the manner of sale whether bulk or packaged. The average plant price per ton of all peat sold in bulk was $7.04, whereas the unit price for packaged peat was $12.05 per ton. Peat sold in bulk for use in mixed fertilizers had the lowest average unit value; packaged peat sold for packing flowers and for seed inoculant had the highest.

The total value of imported peat was $12.3 million, about the same value as in 1963. This value, established at the port of embarkation,

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was approximately equal to prices paid by importers, less transportation and other miscellaneous charges. In some instances, ocean freight and other nondutiable charges such as insurance may have been included inadvertently in this value.

The average unit value of all peat imported was $45.31 per ton, a decrease of $1.98 from 1963, caused principally by lower values of peat imported from Canada. This value was nearly four times greater than the average value of packaged domestic peat, but the values are not comparable because they were assigned at different marketing levels. Also, imported peat has different physical properties than most of the peat produced in the United States. Whereas imported peat usually is light and fibrous, has a low moisture content, and is sold in packages or bales on a volume basis, most packaged domestic peat is relatively decomposed, has a high moisture content, and is sold by weight. Each 100 pounds of a typical imported peat will measure approximately 12 bushels, compared with a volume of only 3 or 4 bushels for a typical domestic peat. A few domestic operations, however, produce peat with properties similar to those of the imported type.

The plant values of domestic peat sold in bulk and in packages are shown in tables 6 and 7.

## FOREIGN TRADE

Imports increased 3 percent in 1964 over 1963 and were but slightly higher than the 1957–59 average quantity imported. The increase over 1963 imports was due mainly to a 6-percent increase in shipments from Canada.

Canada remained the principal source of foreign peat, supplying 83 percent of the total imported. Virtually all of the remainder was shipped from Europe.

Imports from Europe decreased 9 percent, principally because of smaller shipments from West Germany and Sweden. Of the total European shipments, 72 percent was supplied by West Germany, and most of the remainder, from Poland and Danzig, Ireland, and Sweden. Minor quantities were imported from six other countries.

Imported peat was classified according to use into two grades: (1) Poultry and stable and (2) fertilizer. No data were available on ultimate uses, but in general, poultry and stable grade was imported for use as poultry and animal litter, whereas fertilizer grade was imported for various types of soil improvement. Of the total imports, 98 percent was fertilizer grade which entered the United States duty free. A duty of $0.25 per long ton was levied upon peat classified poultry and stable grade.

Canadian shipments were principally fertilizer grade that entered the United States chiefly through the Great Lakes ports and the St. Lawrence, Vermont, and Washington customs districts. West German imports, also chiefly fertilizer grade, were shipped principally to eastern and gulf coast ports.

Tables 8, 9, and 10 show the quantity and value of the different grades of peat imported, by country and customs district.

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**TABLE 8.—Peat moss imported for consumption in the United States, by kind and by country**

| Country | Poultry and stable grade | | Fertilizer grade | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| 1962: | | | | | | |
| North America: | | | | | | |
| Canada | 5,601 | $389,434 | 209,266 | $10,418,008 | 214,867 | $10,807,442 |
| Mexico | 58 | 2,885 | | | 58 | 2,885 |
| Total | 5,659 | 392,319 | 209,266 | 10,418,008 | 214,925 | 10,810,327 |
| Europe: | | | | | | |
| Belgium-Luxembourg | | | 26 | 496 | 26 | 496 |
| Denmark | | | 163 | 5,109 | 163 | 5,109 |
| Finland | | | 25 | 919 | 25 | 919 |
| France | | | 34 | 1,110 | 34 | 1,110 |
| Germany, West | 559 | 20,134 | 33,972 | 1,296,940 | 34,531 | 1,317,074 |
| Ireland | | | 3,002 | 111,635 | 3,002 | 111,635 |
| Netherlands | 104 | 4,611 | 1,953 | 76,312 | 2,057 | 80,923 |
| Norway | | | 32 | 7,912 | 32 | 7,912 |
| Poland and Danzig | | | 8,531 | 335,200 | 8,531 | 335,200 |
| Sweden | | | 3,624 | 169,171 | 3,624 | 169,171 |
| U.S.S.R. | | | 525 | 17,834 | 525 | 17,834 |
| United Kingdom | | | 194 | 7,255 | 194 | 7,255 |
| Total | 663 | 24,745 | 52,081 | 2,029,893 | 52,744 | 2,054,638 |
| Asia: Japan | 9 | 3,203 | | | 9 | 3,203 |
| Grand total | 6,331 | 420,267 | 261,347 | 12,447,901 | 267,678 | 12,868,168 |
| 1963: | | | | | | |
| North America: | | | | | | |
| Canada | 4,135 | 248,500 | 206,649 | 10,038,335 | 210,784 | 10,286,835 |
| Guatemala | 7 | 358 | | | 7 | 358 |
| Mexico | 40 | 4,239 | | | 40 | 4,239 |
| Total | 4,182 | 253,097 | 206,649 | 10,038,335 | 210,831 | 10,291,432 |
| Europe: | | | | | | |
| Denmark | 1 | 767 | 212 | 9,736 | 229 | 10,503 |
| Finland | | | 123 | 5,240 | 123 | 5,240 |
| France | | | 7 | 368 | 7 | 368 |
| Germany, West | 1,273 | 55,440 | 34,099 | 1,411,885 | 35,372 | 1,467,325 |
| Ireland | 62 | 2,200 | 2,293 | 88,993 | 2,355 | 91,193 |
| Netherlands | 84 | 3,959 | 1,558 | 57,993 | 1,642 | 61,952 |
| Poland and Danzig | | | 6,786 | 247,017 | 6,786 | 247,017 |
| Sweden | | | 3,677 | 171,173 | 3,677 | 171,173 |
| Portugal | | | 124 | 2,000 | 124 | 2,000 |
| United Kingdom | | | 130 | 5,345 | 130 | 5,345 |
| Total | 1,436 | 62,366 | 49,009 | 1,999,750 | 50,445 | 2,062,116 |
| Asia: Japan | 4 | 2,085 | 51 | 1,924 | 55 | 4,009 |
| Grand total | 5,622 | 317,548 | 255,709 | 12,040,009 | 261,331 | 12,357,557 |
| 1964: | | | | | | |
| North America: | | | | | | |
| Canada | 3,764 | 208,080 | 220,516 | 10,360,374 | 224,280 | 10,568,454 |
| Mexico | 25 | 4,345 | 257 | 11,800 | 282 | 16,145 |
| Total | 3,789 | 212,425 | 220,773 | 10,372,174 | 224,562 | 10,584,599 |
| South America: Colombia | | | 6 | 267 | 6 | 267 |
| Europe: | | | | | | |
| Belgium-Luxembourg | 1 | 135 | 44 | 1,890 | 45 | 2,025 |
| Denmark | | | 25 | 876 | 25 | 876 |
| Finland | | | 124 | 3,332 | 124 | 3,332 |
| France | | | 181 | 4,832 | 181 | 4,832 |
| Germany, West | 993 | 38,706 | 32,000 | 1,178,560 | 32,993 | 1,217,266 |
| Ireland | | | 2,677 | 94,614 | 2,677 | 94,614 |
| Netherlands | 45 | 1,773 | 732 | 23,383 | 777 | 25,156 |
| Poland and Danzig | | | 7,428 | 242,177 | 7,428 | 242,177 |
| Sweden | | | 1,455 | 67,462 | 1,455 | 67,462 |
| United Kingdom | | | 140 | 7,827 | 140 | 7,827 |
| Total | 1,039 | 40,614 | 44,806 | 1,624,953 | 45,845 | 1,665,567 |
| Asia: Japan | 6 | 2,575 | | | 6 | 2,575 |
| Grand total | 4,834 | 255,614 | 265,585 | 11,997,394 | 270,419 | 12,253,008 |

Source: Bureau of the Census.

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**TABLE 9.—Peat moss imported for consumption in the United States in 1964, by kind and by customs district**

| Customs district | Poultry and stable grade | | Fertilizer grade | | Total | |
|---|---|---|---|---|---|---|
| | Short tons | Value | Short tons | Value | Short tons | Value |
| Arizona | | | 44 | $2,530 | 44 | $2,530 |
| Buffalo | 57 | $2,550 | 37,065 | 1,718,366 | 37,122 | 1,720,916 |
| Chicago | 47 | 1,625 | 204 | 7,348 | 251 | 8,973 |
| Connecticut | | | 20 | 853 | 20 | 853 |
| Dakota | 2,069 | 125,177 | 18,305 | 762,834 | 20,374 | 888,011 |
| Duluth and Superior | 15 | 972 | 83 | 5,362 | 98 | 6,334 |
| Florida | 44 | 3,030 | 6,581 | 226,320 | 6,625 | 229,350 |
| Galveston | 31 | 1,266 | 1,528 | 59,077 | 1,559 | 60,343 |
| Georgia | | | 473 | 15,760 | 473 | 15,760 |
| Hawaii | 25 | 3,746 | 17 | 965 | 42 | 4,711 |
| Laredo | 25 | 4,345 | 91 | 5,877 | 116 | 10,222 |
| Los Angeles | 17 | 588 | 1,647 | 64,547 | 1,664 | 65,135 |
| Maine and New Hampshire | 68 | 2,516 | 1,273 | 49,266 | 1,341 | 51,782 |
| Maryland | 95 | 3,761 | 4,048 | 157,989 | 4,143 | 161,750 |
| Massachusetts | | | 2,044 | 69,243 | 2,044 | 69,243 |
| Michigan | 402 | 18,304 | 23,947 | 1,043,099 | 24,349 | 1,061,403 |
| Mobile | | | 2,860 | 101,303 | 2,860 | 101,303 |
| Montana and Idaho | | | 4,078 | 169,216 | 4,078 | 169,216 |
| New Orleans | 326 | 11,720 | 4,766 | 184,786 | 5,092 | 196,506 |
| New York | 319 | 13,079 | 9,302 | 338,804 | 9,621 | 351,883 |
| North Carolina | | | 196 | 6,163 | 196 | 6,163 |
| Ohio | | | 589 | 19,933 | 589 | 19,933 |
| Oregon | | | 344 | 13,291 | 344 | 13,291 |
| Philadelphia | 109 | 4,205 | 5,374 | 186,671 | 5,483 | 190,876 |
| Puerto Rico | | | 77 | 5,049 | 77 | 5,049 |
| Rochester | | | 15 | 761 | 15 | 761 |
| St. Lawrence | 353 | 14,620 | 32,282 | 1,178,350 | 32,635 | 1,192,970 |
| San Francisco | | | 689 | 23,296 | 689 | 23,296 |
| South Carolina | | | 866 | 32,781 | 866 | 32,781 |
| Vermont | 461 | 18,215 | 49,322 | 1,866,197 | 49,783 | 1,884,412 |
| Virginia | 51 | 1,440 | 2,959 | 99,037 | 3,010 | 100,477 |
| Washington | 320 | 24,555 | 54,356 | 3,577,634 | 54,676 | 3,602,189 |
| Wisconsin | | | 140 | 4,686 | 140 | 4,686 |
| Total | 4,834 | 255,614 | 265,585 | 11,997,394 | 270,419 | 12,253,008 |

Source: Bureau of the Census.

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**TABLE 10.—Peat moss imported from Canada and West Germany for consumption in the United States in 1964, by kind and by customs district**

| Customs district | Canada | | | | West Germany | | | |
|---|---|---|---|---|---|---|---|---|
| | Poultry and stable grade | | Fertilizer grade | | Poultry and stable grade | | Fertilizer grade | |
| | Short tons | Value | Short tons | Value | Short tons | Value | Short tons | Value |
| Arizona | | | | | | | 44 | $2,530 |
| Buffalo | 57 | $2,550 | 37,051 | $1,717,596 | | | | |
| Chicago | | | | | 47 | $1,525 | 204 | 7,348 |
| Connecticut | | | 20 | 853 | | | | |
| Dakota | 2,069 | 125,177 | 18,305 | 762,834 | | | | |
| Duluth and Superior | 15 | 972 | 83 | 5,362 | | | | |
| Florida | | | | | 44 | 3,030 | 6,158 | 210,207 |
| Galveston | | | | | 31 | 1,266 | 1,279 | 49,444 |
| Georgia | | | | | | | 326 | 11,069 |
| Hawaii | 19 | 1,171 | 17 | 965 | | | | |
| Laredo | | | | | | | 91 | 5,877 |
| Los Angeles | | | 106 | 4,858 | 17 | 588 | 1,541 | 59,689 |
| Maine and New Hampshire | 68 | 2,516 | 1,273 | 49,266 | | | | |
| Maryland | | | | | 95 | 3,761 | 2,471 | 98,119 |
| Massachusetts | | | 16 | 810 | | | 417 | 14,414 |
| Michigan | 402 | 18,304 | 23,936 | 1,042,689 | | | 11 | 410 |
| Mobile | | | | | | | 2,727 | 94,942 |
| Montana and Idaho | | | 4,078 | 169,216 | | | | |
| New Orleans | | | 59 | 2,990 | 326 | 11,720 | 2,775 | 109,349 |
| New York | | | | | 273 | 11,171 | 5,780 | 220,591 |
| North Carolina | | | | | | | 102 | 3,331 |
| Ohio | | | | | | | 589 | 19,933 |
| Oregon | | | | | | | 344 | 13,291 |
| Philadelphia | | | | | 109 | 4,205 | 3,898 | 141,661 |
| Puerto Rico | | | | | | | 77 | 5,049 |
| Rochester | | | 15 | 761 | | | | |
| St. Lawrence | 353 | 14,620 | 32,105 | 1,171,280 | | | | |
| San Francisco | | | | | | | 662 | 21,980 |
| South Carolina | | | | | | | 789 | 30,487 |
| Vermont | 461 | 18,215 | 49,307 | 1,865,640 | | | | |
| Virginia | | | | | 51 | 1,440 | 1,527 | 52,224 |
| Washington | 320 | 24,555 | 54,145 | 3,565,254 | | | 48 | 1,929 |
| Wisconsin | | | | | | | 140 | 4,686 |
| Total | 3,764 | 208,080 | 220,516 | 10,360,374 | 993 | 38,706 | 32,000 | 1,178,560 |

Source: Bureau of the Census.

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## TECHNOLOGY

A survey of technical literature revealed that most of the current research on peat was conducted in the Soviet Union where enormous tonnages of peat are used for both soil-improvement and energy purposes.

An important area of Soviet research is concerned with the agricultural applications of peat, and recent studies have developed a new method for evaluating the suitability of various types of peat for use in the production of concentrated peat-mineral-ammonia fertilizers. These fertilizers, which are produced in very large quantities in the U.S.S.R., require peats with particular chemical and physical properties, and the test method, based upon ammonia absorption, aids in the selection of the most suitable peat deposits for development.[2]

Another Soviet study on peat used for agricultural purposes demonstrated the effect of ammoniated peat fertilizers on the microbiological and chemical processes in soils. Besides enhancing the availability of phosphates to plants, these fertilizers further the development of soil organisms that are necessary for the decomposition of organic residues before they can be assimilated by plants. It was found also that ammoniated peat fertilizers increase the number of microorganisms in the soil, an effect that was not noticeable when the usual nitrogen-phosphorus-potassium fertilizers were used.[3]

The degree to which the nutritive elements of mineral fertilizers are assimilated by plants in soils containing additions of peat also was studied in the Soviet Union. These investigations found that when peat is added to soils containing mineral fertilizers, the peat absorbs anions and cations which are assimilated by plants under normal moisture conditions during the whole period of vegetation. It was found, also, that several forms of fertilizers behaved differently in peat soils than in soils without peat and that mineral fertilizer applications on a peat-containing soil changed the protein, carbohydrate, and elemental composition of the plants grown. The addition of chlorine-containing fertilizers, particularly, accelerated the decomposition of peat and hastened the accumulation of hydrolyzed nitrogen compounds.[4]

The effect of drying on the properties of peat was the subject of another Soviet study. This investigation concluded that changes in the hydrous and porous structure of peat directly affected its structural-mechanical properties and that these changes could be controlled by the drying procedure. By controlling the moisture of peat within certain limits, the hydrous and mechanical properties of peat are changed irreversibly because of the change in the chemical structure of the peat substance.[5]

The possibility of obtaining products from peat, useful in the synthesis of organic compounds, was studied also in recent experiments

[2] Chekalov, K. I., and Z. V. Trunina. Concentrated Peat-Mineral-Ammonia Fertilizers. Chem. Abs., v. 62, No. 5, sec. 5840e, Mar. 1, 1965.
[3] Kuznetsova, N. A., and N. V. Kozlova. Microbiological and Chemical Processes in Ammoniated Peat Fertilizers and in Soils Treated With Them. Chem. Abs., v. 62, No. 4, sec. 4569, Feb. 15, 1965.
[4] Kasatkin, M. I. The Assimilability of Nutritive Elements from Mineral Fertilizers on a Peat Background. Chem. Abs., v. 61, No. 13, sec. 16732, Dec. 21, 1964.
[5] Churaev, N. V. Effect of Peat Drying on Its Hydrous and Structural-Mechanical Properties. Chem. Abs., v. 61, No. 9, sec. 10509, Oct. 26, 1964.

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in the U.S.S.R. In these investigations, three types of peat with varying ash contents and degrees of decomposition were carbonized at temperatures between 900° and 1,050° C. Although the less decomposed peat yielded more hydrocarbons than the more decomposed types at all temperatures tested, the latter yielded larger amounts of crude benzene. The properties of the benzene obtained from all three types of peat were similar to the benzene obtained from coal, but the coking of peat at these temperatures yielded from 6.1 to 8.3 gallons of crude benzene per short ton of peat, compared with 2.5 to 3.0 gallons recovered through the high-temperature carbonization of each short ton of a typical coking coal. From 3.3 to 3.4 tons of dry peat were required for each ton of coke produced. In addition to coke and benzene, the process also yielded olefins, aromatic tars, and ammonia.[6]

A meeting of the Group of Experts on the Use of Black Peat in the Production of Fertilizers, Committee for Scientific Research, Organization for Economic Cooperation and Development, was held in Paris, France, in 1964. The agenda included reports on (1) the status of the research on ammonia-peat reactions presently being conducted at University College, Dublin, Ireland; (2) certain storage properties of urea-peat and ammonia-peat mixtures; (3) the development of the process for urea-peat reactions at the Torfinstitut, Hanover, Germany; and (4) the testing of peat mixtures in pot trials. A revised specification of test procedures for peat mixtures was agreed to by members of the committee.[7]

## WORLD REVIEW

World production of peat in 1964 was estimated at 183.4 million short tons, an increase of 7 percent over estimated production for 1963. All but 1.2 million tons (less than 1 percent of the total) was produced in Europe.

The U.S.S.R. was the leading producer with output estimated at 176.1 million tons, 96 percent of the estimated world total. Because of severe shortages of other fuels in certain areas, peat has long been used in the Soviet Union for both industrial and domestic fuel, and current Soviet production targets are aimed at producing 70 million tons of peat for fuel purposes in 1965. A large part of this output will be used for generating electric power, particularly in the area west of Moscow and north of the Donyetz basin where there is a lack of sufficient coal and petroleum. The remainder will be used principally to make briquets for domestic and industrial heating. In addition to fuel peat, the U.S.S.R. also produces tremendous quantities of peat for use in agriculture. The 1964 estimate of production for agricultural use was 110 million tons, and the production goal for agricultural peat in 1965 has been set at 130 million tons. The major part of this peat will be used for producing peat-fertilizer mixtures.

Ireland, with 2.4 million tons of production, ranked second in world output. Peat is used in Ireland principally for generating electric power and, in 1964, peat-fired boilers generated 36 percent of

[6] Kashirskii, V. G. The Coking of Peats. Chem. Abs., v. 61, No. 9, sec. 10505, Oct. 26, 1964.

[7] Organization for Economic Cooperation and Development. Committee for Scientific Research, International Cooperation in Scientific Research. Use of Black Peat in the Production of Fertilizers. OECD Document, DAS/RS/64.42, Paris, France, Mar. 19, 1964.

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the total electricity produced in Ireland. Five peat-fired power stations are presently in operation, and one additional plant under construction is scheduled to go into operation in 1966. Another plant is planned and should be operating by 1975 when the total annual peat requirement of power plants will be 2.4 million tons.

Ireland also produces substantial quantities of peat briquets for fuel and moss peat for use in agriculture. In 1964, three plants produced 320,000 tons of peat briquets, and another plant under construction will produce an additional 135,000 tons by 1968. Output of moss peat, which is produced principally for export, is expected to increase to 350,000 bales in 1965.

West Germany, the third leading producer, had an estimated output of 1.9 million tons, of which 55 percent was used in agriculture, and the remainder, for fuel. Fuel peat was consumed in West Germany principally in producing areas for domestic and industrial heating. Large quantities of agricultural peat were composted with organic wastes and mineral fertilizers before being used for soil improvement. About 3 percent of the West German production for agriculture was exported to the United States.

The United States, East Germany, The Netherlands, Sweden, Canada, Norway, the Republic of Korea, and Finland followed in output, in the order named. All produced more than 100,000 tons in 1964. The United States, with 648,708 tons ranked fourth in world output but had less than 1 percent of the total production.

Table 11 shows world production of peat by country.

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**TABLE 11.—World production of peat, by country[1]**

(Thousand short tons)

| Country | 1960 | 1961 | 1962 | 1963 | » 1964 |
|---|---|---|---|---|---|
| Argentina, fuel • | 3 | 3 | 3 | 3 | 3 |
| Austria, fuel | • 40 | • 40 | • 40 | 11 | 6 |
| Canada, agricultural use [2] | 186 | 224 | 238 | 243 | 245 |
| Denmark, fuel | 187 | 125 | 67 | 55 | 40 |
| Finland: | | | | | |
| Agricultural use | 6 | 4 | 4 | 8 | 4 |
| Fuel | 159 | 128 | 99 | 123 | 121 |
| France: | | | | | |
| Agricultural use | 19 | 33 | 31 | 35 | • 40 |
| Fuel | 2 | ([3]) | • 3 | • 3 | • 3 |
| Germany: | | | | | |
| East • | 550 | 550 | 550 | 550 | 550 |
| West: | | | | | |
| Agricultural use | 895 | 830 | 911 | 884 | • 1,060 |
| Fuel | 871 | 672 | 776 | 837 | • 850 |
| Hungary, agricultural use • | 65 | 65 | 65 | 65 | 70 |
| Ireland: | | | | | |
| Agricultural use | 14 | 21 | 24 | 25 | 21 |
| Fuel | 4,514 | 3,912 | 1,448 | 1,770 | 2,361 |
| Israel, agricultural use • | 50 | 55 | 55 | 55 | 60 |
| Japan • | 80 | 80 | 80 | 80 | 75 |
| Korea, Republic of, agricultural use | 107 | 45 | 137 | 128 | • 125 |
| Netherlands • | 500 | 500 | 500 | 440 | 440 |
| Norway: | | | | | |
| Agricultural use | 42 | 50 | 40 | 40 | 46 |
| Fuel | 198 | 180 | 161 | 115 | 115 |
| Poland, fuel | 125 | 83 | 73 | 112 | • 110 |
| Sweden: | | | | | |
| Agricultural use | 77 | • 70 | 61 | • 75 | • 70 |
| Fuel | 231 | 252 | 169 | • 275 | • 275 |
| U.S.S.R.: | | | | | |
| Agricultural use • | 100,000 | 100,000 | 100,000 | 100,000 | 110,000 |
| Fuel | 59,100 | 57,300 | 38,300 | 64,700 | • 66,100 |
| United States, agricultural use | 471 | 531 | 572 | 579 | 649 |
| World total • [1] [4] | 168,500 | 165,800 | 144,400 | 171,200 | 183,400 |
| Fuel peat (included in world total) • [4] | 66,000 | 63,300 | 41,700 | 68,600 | 70,600 |

• Estimate. » Preliminary.
[1] Includes revisions of data published previously.
[2] In addition, Canada produced a negligible quantity of fuel peat.
[3] Less than 500 tons.
[4] In addition, Iceland, Italy, and Spain produced a negligible quantity of fuel peat.

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# Carbon Black

By Carl W. Kelley [1]

## GENERAL SUMMARY

PRODUCTION in the United States of carbon black has increased from 20 million pounds per year in 1920 to over 2 billion pounds in 1964 valued at $156 million, mostly for consumption by the rubber-tire industry, which uses over 90 percent of total production. Production of over 2 billion pounds in 1964 is a 7.8-percent increase over 1963 and is the first time furnace black production has topped 2 billion pounds. Although 1964 channel black production dropped 6 percent below 1963, carbon black produced by the furnace process, which accounted for 92 percent of total production, increased 9 percent to 2,053 million pounds. Total shipments during 1964 amounted to 2,245 million pounds, a 7 percent increase. This growth parallels the expansion of the automotive and petroleum industries. Along with this expansion have been many advances, both in methods of manufacture and in the quality and variety of blacks available to industry. There are several kinds of carbon black, thermal, channel, furnace, lamp, and oil blacks. Until recently, channel has been the important black in rubber compounding. Following the introduction of the synthetic GR–S, and more recently of "cold rubber," it has been found that certain furnace blacks with particle size larger than that of the standard channel black give superior reinforcement. A great advantage of furnace black is that its yield per unit of gas feedstock is higher than that of channel black.

The 184-million-pound increase in domestic carbon black sales was partially offset by a 37-million-pound decrease in exports. Decrease in exports especially to Europe, is expected to continue. In Europe, as in the United States, the major end use for carbon black is in the manufacture of automobile and truck tires. Although the number of automobiles in Europe is predicted to grow by about 7.5 percent per year, compounded until 1975, the increased demand will be met by a 20 percent increase in existing capacity and by the new plants being built in Europe by U.S. companies. Also, aromatic oils for producing furnace blacks are plentiful now that western Europe's chemical industry is switching to a petroleum base.

[1] Chemist, Division of Petroleum.



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**TABLE 1.—Salient statistics of carbon black produced from natural gas and liquid hydrocarbons in the United States, 1960–64**

(Thousand pounds)

| | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Production: | | | | | |
| Channel process | 292, 422 | 262, 507 | 207, 438 | 179, 012 | 169, 919 |
| Furnace process | 1, 761, 305 | 1, 717, 045 | 1, 849, 026 | 1, 879, 904 | 2, 053, 297 |
| Total | 2, 053, 727 | 1, 979, 552 | 2, 056, 464 | 2, 058, 916 | 2, 223, 216 |
| Shipments: | | | | | |
| Domestic Sales | 1, 429, 618 | 1, 460, 005 | 1, 639, 897 | 1, 727, 420 | 1, 911, 494 |
| Exports | 543, 047 | 522, 331 | 442, 437 | 370, 928 | 333, 907 |
| Total | 1, 972, 665 | 1, 982, 336 | 2, 082, 334 | 2, 098, 348 | 2, 245, 401 |
| Losses | 6, 973 | 2, 299 | 370 | 592 | 910 |
| Stocks of producers, December 31 | 292, 982 | 287, 899 | r 293, 434 | r 254, 216 | 231, 121 |
| Value: | | | | | |
| Production—thousand dollars | 150, 774 | 144, 421 | 145, 256 | 147, 824 | 155, 761 |
| Average per pound—cents | 7. 34 | 7. 30 | 7. 06 | 7. 18 | 7. 01 |

r Revised. No attempt has been made to revise stocks for previous years, since data are not available.

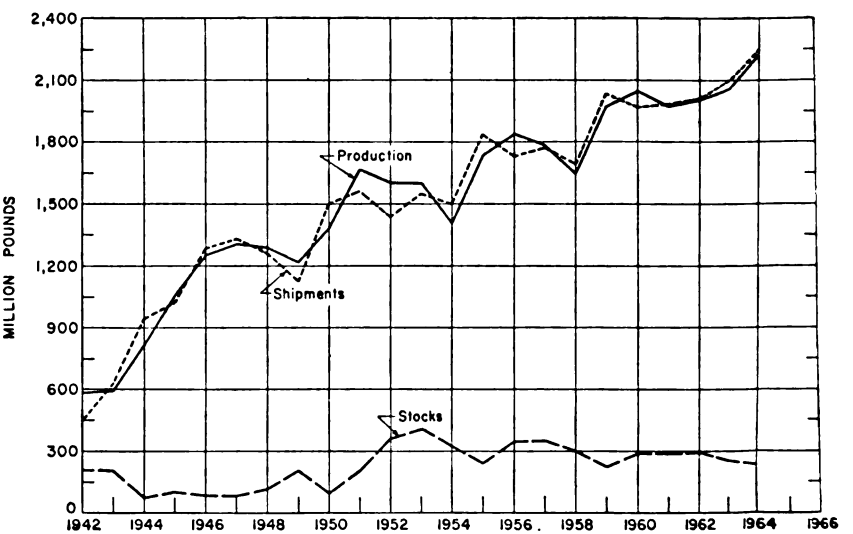


FIGURE 1.—Production, stocks, and shipments of carbon black, 1942–64.

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## SCOPE OF REPORT

Carbon black is a pure grade of quasi-graphitic carbon; particle diameters range from 50 to 5,000 angstroms.

Annual reports were submitted to the Bureau of Mines on a voluntary basis by operators of all commercial plants in the United States.

Monthly figures are based on reports prepared by the National Gas Products Association and are adjusted to agree with the annual reports received by the Bureau of Mines.

Import and export data are compiled by the Bureau of the Census, U.S. Department of Commerce.

Statistics are obtained on both furnace and channel blacks. Furnace blacks are reported in eight grades: Semireinforcing furnace (SRF), high-modulus furnace (HMF), general-purpose furnace (GPF), fast-extrusion furnace (FEF), high-abrasion furnace (HAF), superabrasion furnace (SAF), intermediate-abrasion furnace (ISAF), and thermal.

## PRODUCTION AND CAPACITY

**Production by States.**—Output of carbon black in 1964 was 2,223 million pounds, an 8 percent increase over the 1963 figure. Texas, the major producing State, showed an increase of 5 percent. The output in Louisiana increased 12 percent in 1964; however, a small quantity of the Louisiana production was included in production of Texas to avoid disclosure of confidential data. Texas accounted for 52 percent of the national production, and 33 percent came from Louisiana; the remaining 15 percent came from plants in Arkansas, California, Kansas, New Mexico, and Oklahoma.

**Output and Shipments by Grades.**—Carbon black output by the furnace process was 2,053 million pounds, which is 92 percent of the national production. High-abrasion furnace (HAF) and intermediate-abrasion furnace (ISAF) continued to represent about half of total furnace black output. Channel black production continued to decline and was 9 million pounds less than in 1963. Total carbon black shipments, including exports and losses, exceeded production by 23 million pounds, resulting in a decline in stocks during the year.

**Number and Capacity of Plants.**—The number of channel and furnace plants each declined by one during the year, so at the end of the year only 37 carbon black plants were operating. The total daily capacity of all operating plants was 7,269,300 pounds, an increase in capacity of 243,300 pounds during the year. Twenty plants operated in Texas had 54 percent of total operating capacity; Louisiana with 9 plants accounted for 29 percent. The remaining 17 percent of capacity was distributed among eight plants in the five producing States.

**Method and Yield.**—During the year 106,759 million cubic feet of natural gas was used to produce 416,359 thousand pounds of furnace black (a yield of 11.9 pounds per thousand cubic feet) and 157,639 thousand pounds of channel black with an average yield of 2.2 pounds per thousand cubic feet. At furnace black plants 354,874 thousand gallons of liquid hydrocarbons was used to produce 1,649,218 thousand pounds of carbon black, a yield of 4.6 pounds per gallon. The propor-

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tion of furnace black output derived from liquid hydrocarbons leveled off at about 81 percent during the 1961–63 period and continues at the same proportion.

**TABLE 2.—Carbon black produced from natural gas and liquid hydrocarbons in the United States, 1960–64, by States and districts**

(Thousand pounds)

| State | 1960 | 1961 | 1962 | 1963 | 1964 | Change from 1963 (percent) |
|---|---|---|---|---|---|---|
| Louisiana | [1] 631, 488 | [1] 582, 833 | [1] 608, 499 | 649, 170 | 725, 669 | +12 |
| Texas | [1] 1, 054, 856 | [1] 1, 070, 843 | [1] 1, 106, 874 | 1, 105, 189 | 1, 165, 593 | +5 |
| Other States | 337, 383 | 325, 876 | 341, 091 | 304, 557 | 331, 954 | +9 |
| Total | 2, 053, 727 | 1, 979, 552 | 2, 056, 464 | 2, 058, 916 | 2, 223, 216 | +8 |

[1] Small quantity of channel black produced in Louisiana included in Texas to avoid disclosure of confidential data.

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**TABLE 3.—Production and shipments of carbon black in the United States in 1964, by months and grades**

(Thousand pounds)

| Month | Furnace | | | | | | | | | Channel | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SRF [1] | HMF [2] | GPF [3] | FEF [4] | HAF [5] | SAF [6] | ISAF [7] | Thermal | Total | | |
| | PRODUCTION [8] | | | | | | | | | | |
| January | 27,747 | 4,117 | 15,579 | 20,838 | 40,018 | 1,830 | 38,939 | 17,688 | 166,756 | 14,530 | 181,286 |
| February | 24,544 | 3,641 | 14,393 | 20,980 | 35,505 | 981 | 38,281 | 15,921 | 154,246 | 14,170 | 168,416 |
| March | 29,034 | 3,539 | 14,741 | 23,295 | 41,475 | 1,785 | 33,816 | 20,558 | 168,243 | 14,738 | 182,981 |
| April | 29,001 | 3,387 | 15,233 | 21,515 | 43,211 | 2,737 | 35,713 | 20,370 | 171,167 | 14,417 | 185,584 |
| May | 27,952 | 4,486 | 17,518 | 21,289 | 44,401 | 1,928 | 39,454 | 21,350 | 178,378 | 14,648 | 193,026 |
| June | 26,494 | 3,611 | 15,089 | 23,937 | 42,995 | 579 | 37,449 | 18,787 | 168,941 | 13,902 | 182,843 |
| July | 26,348 | 2,544 | 16,570 | 20,996 | 40,365 | 2,508 | 40,508 | 17,614 | 167,453 | 13,820 | 181,273 |
| August | 27,952 | 3,018 | 16,820 | 18,047 | 43,777 | 1,857 | 41,283 | 19,689 | 172,443 | 13,862 | 186,305 |
| September | 26,850 | 3,251 | 14,465 | 23,058 | 43,889 | 690 | 41,162 | 20,074 | 173,439 | 13,673 | 187,112 |
| October | 25,564 | 3,945 | 18,674 | 22,987 | 44,322 | 1,762 | 41,603 | 18,159 | 177,016 | 13,905 | 190,921 |
| November | 26,097 | 3,403 | 15,049 | 24,873 | 45,490 | 2,757 | 41,607 | 19,607 | 178,883 | 13,862 | 192,745 |
| December | 28,338 | 2,165 | 14,766 | 21,743 | 44,133 | 705 | 42,608 | 21,874 | 176,332 | 14,392 | 190,724 |
| Total | 325,921 | 41,107 | 188,897 | 263,558 | 509,581 | 20,119 | 472,423 | 231,691 | 2,053,297 | 169,919 | 2,223,216 |
| | SHIPMENTS (INCLUDING EXPORTS) [9] | | | | | | | | | | |
| January | 26,894 | 4,087 | 15,306 | 22,462 | 44,491 | 908 | 38,603 | 18,725 | 171,476 | 13,732 | 185,208 |
| February | 24,791 | 4,764 | 12,980 | 23,053 | 35,747 | 1,176 | 34,713 | 17,875 | 155,099 | 15,857 | 170,956 |
| March | 28,100 | 2,404 | 15,820 | 23,230 | 43,870 | 1,718 | 37,694 | 19,703 | 172,539 | 14,612 | 187,151 |
| April | 28,095 | 2,885 | 14,905 | 22,157 | 44,317 | 2,165 | 38,286 | 20,999 | 173,809 | 15,188 | 188,997 |
| May | 26,482 | 4,410 | 15,630 | 20,562 | 41,560 | 1,632 | 38,817 | 18,966 | 168,059 | 13,570 | 181,629 |
| June | 26,752 | 3,554 | 15,194 | 20,659 | 39,799 | 1,164 | 40,523 | 18,542 | 166,187 | 13,738 | 179,925 |
| July | 22,854 | 3,103 | 13,920 | 20,559 | 42,952 | 1,065 | 40,906 | 18,691 | 164,050 | 14,391 | 178,441 |
| August | 28,735 | 2,601 | 15,191 | 22,089 | 46,635 | 1,615 | 41,790 | 19,580 | 178,236 | 13,000 | 191,236 |
| September | 26,616 | 3,225 | 16,282 | 22,181 | 47,053 | 2,271 | 43,999 | 20,492 | 182,119 | 14,657 | 196,776 |
| October | 28,059 | 3,881 | 18,284 | 24,408 | 48,706 | 1,755 | 46,359 | 19,678 | 191,130 | 15,361 | 206,491 |
| November | 24,717 | 1,747 | 15,747 | 23,281 | 43,571 | 1,962 | 42,916 | 18,444 | 172,385 | 16,478 | 188,863 |
| December | 25,727 | 3,139 | 14,601 | 21,413 | 46,123 | 1,719 | 42,146 | 20,805 | 175,673 | 14,965 | 190,638 |
| Total | 317,822 | 39,800 | 183,860 | 266,054 | 524,824 | 19,150 | 486,752 | 232,500 | 2,070,762 | 175,549 | 2,246,311 |

[1] Semireinforcing furnace.
[2] High-modulus furnace.
[3] General-purpose furnace.
[4] Fast-extrusion furnace.
[5] High-abrasion furnace.
[6] Superabrasion furnace.
[7] Intermediate-abrasion furnace.
[8] Compiled from reports of a consulting engineer of the carbon black industry and of producing companies not included in his figures. Figures adjusted to agree with annual reports of individual producers.
[9] Includes losses.

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**TABLE 4.—Number and capacity of carbon black plants operated in the United States, 1963–64**

| State or district | County or parish | Number of plants | | | | Total daily capacity (pounds) | |
|---|---|---|---|---|---|---|---|
| | | 1963 | | 1964 | | 1963 | 1964 |
| | | Channel | Furnace | Channel | Furnace | | |
| Texas | Aransas | 1 | 1 | 1 | 1 | 3,799,000 | 3,945,300 |
| | Brooks | 1 | | | | | |
| | Carson | 1 | | 1 | | | |
| | Ector | 1 | | 1 | | | |
| | Gaines | 1 | | 1 | | | |
| | Gray | 1 | 1 | 1 | 1 | | |
| | Harris | | 1 | | 1 | | |
| | Howard | | 2 | | 2 | | |
| | Hutchinson | 1 | 4 | 1 | 4 | | |
| | Montgomery | | 1 | | 1 | | |
| | Moore | | 1 | | 1 | | |
| | Orange | | 1 | | 1 | | |
| | Terry | | 1 | | 1 | | |
| | Wheeler | | 1 | | 1 | | |
| Total Texas | | 7 | 14 | 6 | 14 | 3,799,000 | 3,945,300 |
| Louisiana | Avoyelles | | 1 | | 1 | 1,927,000 | 2,130,000 |
| | Calcasieu | | 1 | | 1 | | |
| | Evangeline | | 1 | | 1 | | |
| | Ouachita | | 2 | | 2 | | |
| | St. Mary | 1 | 3 | 1 | 3 | | |
| Total Louisiana | | 1 | 8 | 1 | 8 | 1,927,000 | 2,130,000 |
| Arkansas | Union | | 1 | | 1 | 1,300,000 | 1,194,000 |
| California | Contra Costa | | 1 | | 1 | | |
| | Kern | | 2 | | 2 | | |
| Kansas | Grant | | 2 | | 1 | | |
| New Mexico | Lea | 1 | 1 | 1 | 1 | | |
| Oklahoma | Kay | | 1 | | 1 | | |
| | | 1 | 8 | 1 | 7 | 1,300,000 | 1,194,000 |
| Total United States | | 9 | 30 | 8 | 29 | 7,026,000 | 7,269,300 |

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**TABLE 5.—Carbon black and the feedstocks used in its production, 1963–64, by States**

| | Louisiana | Texas | Other States [1] | Total |
|---|---|---|---|---|
| 1963: | | | | |
| Carbon black production: | | | | |
| Total—thousand pounds | 649,170 | 1,105,189 | 304,557 | 2,058,916 |
| Value—thousand dollars | 43,058 | 83,605 | 21,161 | 147,824 |
| Average value—cents per pound | 6.63 | 7.56 | 6.94 | 7.18 |
| Natural gas used: | | | | |
| Total—million cubic feet | 21,924 | 76,750 | 18,704 | 117,378 |
| Value—thousand dollars | 3,310 | 8,405 | 2,677 | 14,392 |
| Average value—cents per thousand cubic feet | 15.10 | 11.62 | 14.31 | 12.70 |
| Carbon black produced—thousand pounds | 267,375 | 201,600 | 73,952 | 542,927 |
| Liquid hydrocarbons used: | | | | |
| Total—thousand gallons | 90,135 | 194,972 | 47,996 | 333,103 |
| Value—thousand dollars | 6,417 | 12,856 | 2,925 | 22,198 |
| Average value—cents per gallon | 7.12 | 6.59 | 6.09 | 6.66 |
| Carbon black produced—thousand pounds | 381,795 | 903,589 | 230,605 | 1,515,989 |
| 1964: | | | | |
| Carbon black production: | | | | |
| Total—thousand pounds | 725,669 | 1,165,593 | 331,954 | 2,223,216 |
| Value—thousand dollars | 47,908 | 86,494 | 21,359 | 155,761 |
| Average value—cents per pound | 6.60 | 7.42 | 6.43 | 7.01 |
| Natural gas used: | | | | |
| Total—million cubic feet | 21,642 | 65,438 | 19,679 | 106,759 |
| Value—thousand dollars | 3,314 | 7,948 | 2,980 | 14,242 |
| Average value—cents per thousand cubic feet | 15.31 | 12.15 | 15.14 | 13.34 |
| Carbon black produced—thousand pounds | 298,750 | 188,416 | 86,832 | 573,998 |
| Liquid hydrocarbons used: | | | | |
| Total—thousand gallons | 102,153 | 206,517 | 46,204 | 354,874 |
| Value—thousand dollars | 7,328 | 14,003 | 2,773 | 24,104 |
| Average value—cents per gallon | 7.17 | 6.78 | 6.00 | 6.79 |
| Carbon black produced—thousand pounds | 426,919 | 977,177 | 245,122 | 1,649,218 |

[1] Arkansas, California, Kansas, New Mexico, and Oklahoma.

**TABLE 6.—Natural gas and liquid hydrocarbons used in manufacturing carbon black in the United States and average yield, 1960–64**

| | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Natural gas used—million cubic feet | 197,628 | 161,377 | 133,302 | 117,378 | 106,759 |
| Average yield of carbon black per thousand cubic feet—pounds | 3.23 | 3.71 | 4.03 | 4.63 | 5.38 |
| Average value of natural gas used per thousand cubic feet—cents | 10.05 | 10.37 | 11.25 | 12.70 | 13.34 |
| Liquid hydrocarbons used—thousand gallons | 313,020 | 307,637 | 330,399 | 333,103 | 354,874 |
| Average yield of carbon black per gallon—pounds | 4.52 | 4.49 | 4.60 | 4.55 | 4.65 |
| Average value of liquid hydrocarbons used per gallon—cents | 7.05 | 7.02 | 6.71 | 6.66 | 6.79 |
| Number of producers reporting | 11 | 11 | 10 | 9 | 9 |
| Number of plants | 42 | 44 | 41 | 39 | 37 |

## CONSUMPTION AND USES

Shipments during the year totaled 2,245 million pounds and were 7 percent above those in 1963. An increase of 174 million pounds in domestic sales was partially offset by a decline of 37 million pounds in exports.

The rubber industry consumes about 94 percent of all carbon black produced in the manufacture of tires. It is in this application that the reinforcing ability of carbon black is most strikingly displayed. The tread of a modern passenger-car tire contains about 30 percent by weight of reinforcing black and will provide some 40,000 miles of

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road wear. By contrast, an equal loading of an inert filler, such as clay, would provide less than 4,000 miles of service. The use of carbon black improves the properties of both natural and synthetic rubber and is employed in tire carcass, tread base, side wall, and the inner tubes. Each application has its particular requirements, as for example, in the tread, resistance to abrasive wear is paramount, while in the side wall, resistance to cracking and low heat generation are essential. In order to meet these varied requirements, some 15 separate grades of carbon black are produced. The major differences among these grades of black is particle size.

In extruded rubber goods fast extrusion rates and conformity to die dimensions are of particular importance. This property is most pronounced in the oil-furnace blacks.

Various carbon blacks can be compounded into rubber to provide stocks with either high electrical resistance or good conducting properties.

Carbon black was originally produced as a pigment for the printing-ink industry; the 48 million pounds presently consumed in ink manufacture is the second most important use of the commodity. Two grades of carbon black are produced for the printing-ink industry; "short-ink" black used in the preparation of news inks and "long-ink" blacks used in lithographic or halftone printing inks. Because news inks are relatively cheap, raw materials cost is of first importance; hence only the cheaper nonpremium grades of black are used, formerly channel blacks, but now almost entirely oil-furnace blacks. However, lithographic inks require a high quality specific type of product, not feasible to produce by the furnace process, so their source is still the channel process.

Carbon black is still the favored black pigment in the paint and lacquer industry. To date only the channel process has been capable of producing blacks sufficiently fine in particle size and masstone, the most important requirements in the manufacture of paints and lacquers.

Recently it has been found that the addition of 2 percent of a medium-color black to polyethylene imports vastly improved resistance to embrittlement caused by sunlight aging. This application has resulted in a great increase in the life of polyethylene coating on cables exposed to sunlight, and the protective action extends to other plastics as well.

The applications of carbon black discussed above accounts for about 98 percent of the consumption, and the remainder, although small, covers a variety of other uses among which are the dry cell industry, which consumes about 7 million pounds black a year. Formerly specific requirements were met only by acetylene black, but recently oil-furnace blacks, which compare favorably with acetylene black, are in production. Duplicating carbon paper is also an important application of carbon black. A premium grade of channel black similar to that employed in lithographic ink is used. There are many other applications of carbon black, demonstrating its versatility. Among them are its use as a tinting agent in nylon, anticaking agent in cements and fertilizers, pigment in the confectionery and cosmetic industry, and a vital ingredient in liquid-oxygen explosives.

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**TABLE 7.—Sales of carbon black for domestic consumption in the United States, 1960–64 by uses**

(Thousand pounds)

| Uses | 1960 | 1961 | 1962 | 1963 | 1964 | Change from 1963 (percent) |
|---|---|---|---|---|---|---|
| Rubber | 1,362,912 | 1,382,893 | 1,551,204 | 1,629,905 | 1,789,432 | +10 |
| Ink | 47,980 | 42,987 | 41,162 | 46,471 | 45,688 | −2 |
| Paint | 12,270 | 15,267 | 15,766 | 13,008 | 17,982 | +38 |
| Miscellaneous | 6,456 | 18,858 | 31,765 | 38,036 | 58,392 | +54 |
| Total | 1,429,618 | 1,460,005 | 1,639,897 | 1,727,420 | 1,911,494 | +11 |

## STOCKS

Total stocks of carbon black for 1962 were revised because of a change in one company's reporting procedure. No attempt was made to revise data for earlier years. Total stocks decreased 23 million pounds in 1964. Stocks of furnace black declined about 18 million pounds, and stocks of channel black decreased 6 million pounds. Four of the eight grades of furnace black increased during 1964, while the other four declined.

**TABLE 8.—Producers' stock of channel- and furnace-type blacks in the United States, December 31, 1960–64**

(Thousand pounds)

| Year | Furnace | | | | | | | | | Channel | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SRF [1] | HMF [1] | GPF [1] | FEF [1] | HAF [1] | SAF [1] | ISAF [1] | Thermal | Total | | |
| 1960 | 43,402 | 12,050 | 7,827 | 23,420 | 66,325 | 4,437 | 39,075 | 23,032 | 219,568 | 73,424 | 292,992 |
| 1960 [2] | 43,402 | 11,040 | 8,827 | 23,420 | 66,325 | 4,437 | 39,075 | 23,032 | 219,558 | 73,424 | 292,982 |
| 1961 | 41,171 | 7,694 | 9,055 | 22,069 | 69,799 | 8,510 | 62,728 | 16,229 | 237,255 | 50,644 | 287,899 |
| 1962 r | 38,509 | 12,046 | 24,619 | 28,507 | 68,470 | 8,939 | 58,471 | 13,575 | 253,136 | 40,298 | 293,434 |
| 1963 r | 31,101 | 7,927 | 21,129 | 23,137 | 61,473 | 4,115 | 50,391 | 6,338 | 205,611 | 48,605 | 254,216 |
| 1964 | 39,200 | 9,234 | 26,166 | 20,641 | 46,230 | 5,084 | 36,062 | 5,529 | 188,146 | 42,975 | 231,121 |

r Revised. No attempt has been made to revise stocks for previous years since data are not available.
[1] For explanation, see footnotes to table 3.
[2] Reclassification of grades.

## EXPORTS

Total exports of carbon black continued a downward trend in 1964. Exports decreased 37,021,000 pounds to 333,907,000 pounds. Furnace black exports were down 36,922,000 pounds from the 1963 level, and channel black exports also were down 99,000 pounds. The decline in exports during the past 4 years was due to the expanded production in foreign countries.



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**TABLE 9.—U.S. exports of carbon black, 1964, by months**

(Thousand pounds)

| Month | Channel | Furnace | Total | Month | Channel | Furnace | Total |
|---|---|---|---|---|---|---|---|
| January | 4,346 | 17,367 | 21,713 | August | 5,243 | 19,103 | 24,346 |
| February | 6,591 | 20,356 | 26,947 | September | 8,187 | 32,280 | 40,467 |
| March | 7,040 | 23,050 | 30,090 | October | 4,751 | 19,199 | 23,950 |
| April | 6,726 | 20,851 | 27,577 | November | 5,148 | 20,627 | 25,775 |
| May | 5,771 | 22,203 | 27,974 | December | 8,528 | 23,553 | 32,081 |
| June | 6,389 | 19,983 | 26,372 | | | | |
| July | 6,358 | 19,957 | 26,315 | Total: 1964 | 75,378 | 258,529 | 333,907 |
| | | | | 1963 | 75,477 | 295,451 | 370,928 |

Source: Bureau of the Census.

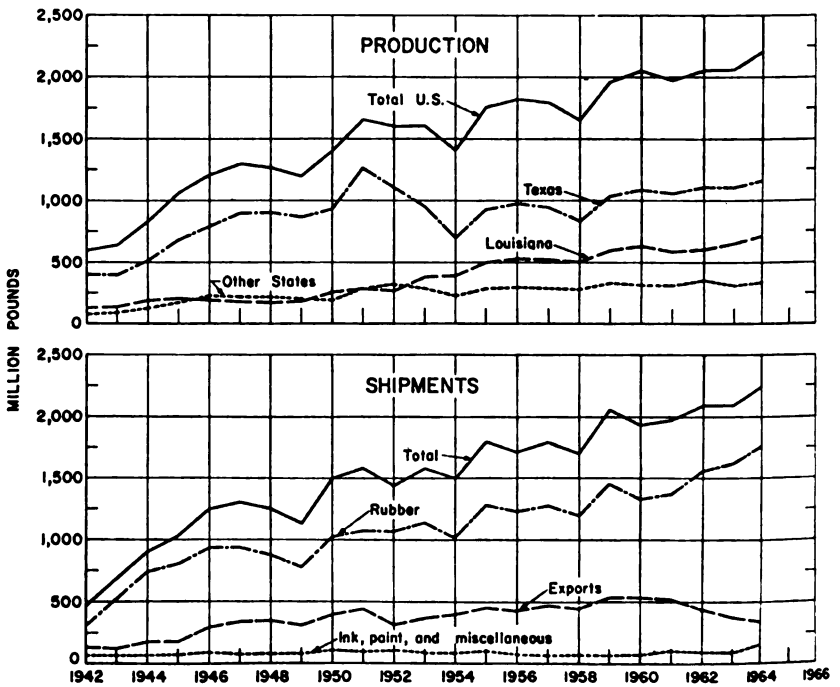


FIGURE 2.—Production and shipments of carbon black, 1942–64.

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**TABLE 10.—U.S. exports of carbon black, by countries**

| Destination | 1962 | | 1963 | | 1964 | |
|---|---|---|---|---|---|---|
| | Thousand pounds | Thousand dollars | Thousand pounds | Thousand dollars | Thousand pounds | Thousand dollars |
| North America: | | | | | | |
| Canada | 25,540 | $2,177 | 29,266 | $2,435 | 22,578 | $1,905 |
| Guatemala | 701 | 62 | 1,482 | 128 | 1,364 | 123 |
| Mexico | 24,245 | 1,920 | 18,880 | 1,581 | 3,889 | 364 |
| Other North America | 16 | 4 | 114 | 10 | 84 | 15 |
| Total | 50,502 | 4,163 | 49,742 | 4,154 | 27,915 | 2,407 |
| South America: | | | | | | |
| Argentina | 24,974 | 2,133 | 5,967 | 533 | 10,710 | 1,051 |
| Brazil | 12,777 | 1,022 | 6,600 | 578 | 4,749 | 407 |
| Chile | 2,926 | 255 | 5,273 | 488 | 5,762 | 588 |
| Colombia | 9,535 | 848 | 11,143 | 995 | 9,065 | 820 |
| Peru | 3,890 | 336 | 3,964 | 344 | 4,578 | 401 |
| Uruguay | 2,094 | 184 | 2,157 | 184 | 2,744 | 238 |
| Venezuela | 9,979 | 865 | 2,188 | 201 | 1,729 | 168 |
| Other South America | 237 | 22 | 1,332 | 121 | 1,315 | 126 |
| Total | 66,412 | 5,665 | 38,624 | 3,444 | 40,652 | 3,799 |
| Europe: | | | | | | |
| Austria | 2,097 | 160 | 1,728 | 131 | 1,738 | 131 |
| Belgium-Luxembourg | 8,890 | 808 | 4,457 | 430 | 5,139 | 498 |
| Czechoslovakia | 110 | 11 | 4,616 | 410 | 265 | 23 |
| Denmark | 1,506 | 194 | 1,159 | 177 | 1,107 | 148 |
| Finland | 1,571 | 144 | 852 | 82 | 621 | 58 |
| France | 48,474 | 4,842 | 33,905 | r 3,346 | 41,583 | 3,988 |
| Germany, West | 48,543 | 4,120 | 39,445 | 3,242 | 41,713 | 3,420 |
| Greece | 394 | 31 | 563 | 45 | 289 | 24 |
| Ireland | 128 | 21 | 88 | 13 | 27 | 5 |
| Italy | 47,206 | 4,369 | 32,746 | 3,194 | 21,317 | 2,129 |
| Netherlands | 8,089 | 796 | 6,738 | 647 | 8,433 | 836 |
| Norway | 1,781 | 159 | 1,382 | 129 | 998 | 96 |
| Poland and Danzig | 4 | 1 | 375 | 32 | 287 | 25 |
| Portugal | 1,744 | 169 | 2,229 | 211 | 2,526 | 238 |
| Spain | 5,921 | 582 | 3,129 | 376 | 4,435 | 482 |
| Sweden | 6,780 | 622 | 4,161 | 377 | 4,265 | 379 |
| Switzerland | 1,440 | 157 | 1,593 | 159 | 1,464 | 138 |
| U.S.S.R. | | | 18,631 | 1,602 | 3,512 | 303 |
| United Kingdom | 23,576 | 3,180 | 19,418 | 2,780 | 25,384 | 3,408 |
| Yugoslavia | 1,577 | 159 | 1,678 | 230 | 2,165 | 243 |
| Other Europe | 151 | 19 | 43 | 4 | 459 | 37 |
| Total | 209,982 | 20,544 | 178,936 | r 17,617 | 167,727 | 16,609 |
| Asia: | | | | | | |
| India | 39,409 | 3,300 | 30,948 | 2,575 | 24,146 | 1,987 |
| Indonesia | 2,822 | 235 | 6,448 | 561 | 1,778 | 161 |
| Iran | 1,037 | 87 | 1,253 | 120 | 1,636 | 161 |
| Israel | 5,685 | 477 | 3,145 | 267 | 4,768 | 416 |
| Japan | 18,241 | 2,162 | 10,117 | 1,617 | 6,028 | 1,104 |
| Korea, Republic of | 6,048 | 573 | 3,356 | 302 | 6,154 | 597 |
| Malaysia Republic | 1,510 | 143 | 1,613 | 141 | 1,042 | 91 |
| Pakistan | 648 | 61 | 699 | 70 | 1,603 | 147 |
| Philippines | 7,462 | 673 | 9,357 | 843 | 10,220 | 890 |
| Taiwan | 2,646 | 234 | 1,310 | 115 | 427 | 55 |
| Turkey | 2,977 | 240 | 3,833 | 339 | 6,102 | 508 |
| Other Asia | 1,905 | 201 | 3,124 | 311 | 4,190 | 396 |
| Total | 90,390 | 8,386 | 75,203 | 7,261 | 68,094 | 6,513 |
| Africa: | | | | | | |
| South Africa, Republic of | 11,860 | 1,002 | 15,330 | r 1,301 | 16,287 | 1,405 |
| United Arab Republic (Egypt) | 62 | 6 | 2,333 | 214 | 1,029 | 88 |
| Other Africa | 977 | 96 | 771 | 72 | 1,463 | 127 |
| Total | 12,899 | 1,104 | 18,434 | r 1,587 | 18,779 | 1,620 |
| Oceania: | | | | | | |
| Australia | 8,615 | 854 | 6,588 | 636 | 7,134 | 653 |
| New Zealand | 3,637 | 320 | 3,401 | 311 | 3,606 | 328 |
| Total | 12,252 | 1,174 | 9,989 | 947 | 10,740 | 981 |
| Grand total | 442,437 | 41,036 | 370,928 | r 35,010 | 333,907 | 31,929 |

r Revised.

Source: Bureau of the Census.

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## WORLD PRODUCTION

TABLE 11.—World production of carbon black by countries[1 2]

(Thousand pounds)

| Country[1] | 1960 | 1961 | 1962 | 1963 | 1964 p |
|---|---|---|---|---|---|
| Argentina | | | NA | 12,820 | NA |
| Brazil | 35,274 | 37,467 | 43,430 | 54,784 | NA |
| France | 76,941 | e 101,400 | 138,890 | 167,991 | NA |
| Germany, West | 154,878 | 173,462 | 201,549 | 221,119 | e 265,200 |
| Italy | 17,637 | 29,769 | 65,426 | 97,717 | 147,708 |
| Japan | 55,093 | 93,936 | 147,025 | 176,882 | 243,602 |
| Rumania | 55,186 | 62,589 | 65,062 | 73,142 | 78,030 |
| South Africa, Republic of | | 4,123 | 16,840 | 21,402 | 26,334 |
| Spain | NA | NA | 2,866 | 2,866 | NA |
| Taiwan | 310 | 676 | 453 | 425 | 434 |
| United Kingdom | 322,500 | 300,900 | 281,700 | 308,200 | 338,600 |
| United States | 2,053,727 | 1,979,552 | 2,056,464 | 2,058,916 | 2,223,216 |
| Venezuela | | | NA | 10,000 | 13,499 |
| Yugoslavia | 8,514 | 9,696 | 8,234 | 9,438 | 10,523 |

e Estimate.
p Preliminary.
NA Not available.
[1] Australia, China, India, Mexico, Netherlands, and Sweden produce carbon black, but production data are not available. Canada's carbon black capacity was increased late in 1961 to about 100 million pounds annually. Actual production is not published to avoid disclosure of individual company data.
[2] This table incorporates some revisions.

## TECHNOLOGY

Carbon black is a semigraphitic form of carbon prepared in a fine state of subdivision by the partial combustion of hydrocarbons. These hydrocarbons may be either gaseous or liquid products of the petroleum industry, that is, natural gas or other gas or oil fractions from refinery streams.

Up to 1945 carbon black was made by the channel, gas-furnace, and thermal processes, and the principal raw material was natural gas, with occasional enrichment of distillate oils. Since the introduction of the oil-furnace process in 1945, the position has changed such that more black is made currently from liquid hydrocarbons than from gas and, it is anticipated that liquid hydrocarbon raw material will predominate increasingly. Tremendous quantities of natural gas are still used, however.

There are several kinds of carbon black produced by means of several manufacturing processes, one of which is the channel process. The first channel plant was built in 1872 in New Cumberland, W. Va. When the natural gas of this area was subsequently piped to the main cities of Pennsylvania and Ohio the industry migrated to Louisiana, until the pipelines were constructed in that region, when the industry migrated once more. Between 1925–29 it became established in the Texas Panhandle; from that time until recently Texas produced more than 70 percent of the world's supply of carbon black. The channel process of carbon-black manufacture involves burning natural gas in a deficiency of air. Thousands of smoky flames, burning from small lava tips, are impinged on cool metal surfaces, depositing a layer of soot or carbon black, which is continuously removed by scraping devices. The depositing surfaces, long channel irons, moving slowly back and forth over the flames are collectors of the product

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and have since lent their name to both the methods of manufacture and the product. The products are referred to as channel blacks, although the term gas blacks as well as the term impingement blacks are also in common use. The channel process produces several grades of very fine carbon blacks which have maximum color and tinctorial strength, very applicable for reinforcing rubber. By altering the distance of the lava tip from the channel, modifying the volume of gas through the tip, and varying the amount of air admitted, it is possible to change the particle size of the black.

Although the channel process has been almost replaced by the more efficient oil-furnace process as the principal source of rubber grades of carbon black, it still remains the principal source of the premium grades of the high- and intermediate-color black used in the paint and lacquer industry, as well as the premium grades of halftone or lithographic blacks used in the printing ink industry.

The thermal process produces coarser blacks, giving softer rubber stocks more desired for tire carcasses than the narrow range of fine-particle carbon blacks manufactured by the channel process. In the thermal process, as the name implies a thermal cracking process, natural gas is passed on a make cycle through checker-brick furnaces preheated to 2,500 to 3,000° F. At these temperatures the gas decomposes to carbon and hydrogen. After the make cycle, the furnace cools off and is then fired with an air-gas mixture and heated once again to make temperatures. It is then charged with either natural gas or natural gas diluted with hydrogen and carbon dioxide, and the make cycle is repeated.

Thermal black particles are approximately 17 to 20 times larger in size than those made by the channel process.

The gas-furnace process, introduced in 1922, is an extension of the channel process in that laminar diffusion flames are produced, but in more concentrated fashion, and confined by a refractory furnace. The development of this process resulted from the desire to improve recovery and produce blacks with reinforcing ability intermediate between the thermal and channel blacks. In this process special slotted or drilled burners are used, through which natural gas and air in alternate layers are fired into large insulated furnaces or retorts. In a swirling mass of partial combustion the natural gas is converted to carbon black. The hot carbon, suspended in the spent gas, is carried from the furnace through large flues to a water-spray tower where the reaction is quenched. The cooled carbon aerosal is then partially flocculated in an electrical precipitator and subsequently removed and collected in a series of cyclone separators. Average yield is four times that of the channel process. Although gas-furnace black does not provide sufficient reinforcement for use in tire treads it is superior to thermal black and has found wide application in a variety of rubber goods in which abrasive wear is not a factor.

The oil-furnace process developed in 1943, represented a significant advance in the carbon black industry. The use of liquid hydrocarbons or oils was substituted for natural gas in the furnace process. The burner assemblies of the gas-furnace process was replaced by burner nozzles through which liquid hydrocarbons could be either atomized or vaporized into the furnace together with the requisite amount of

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air. The first product of the process was a medium-reinforcing black, but further research on equipment design led to production of a black equal in particle size to channel black and superior in reinforcing properties. This superiority persists in both synthetic and natural rubber stocks. From the time of its introduction the oil furnace process has increased steadily due to its high efficiency and versatility, taking over production from both the channel and gas-furnace process until more than three quarters of all carbon black now produced is made by the oil-furnace process. The raw material preferred is a highly aromatic oil, and although some auxiliary gas is used, the process is independent of natural gas resources. As a result, carbon black plants may now be located anywhere the oil may be shipped.

Among the other methods of manufacturing carbon black, the acetylene process should be included. In this process, principally confined to Canada, the black is made by the thermal decomposition of acetylene. Acetylene is fed into a retort through specially designed nozzles. The black aerosol enters a settling chamber and is periodically removed. The decomposed hydrogen is vented and burned.

Lampblacks, the oldest member of the carbon-black family, are manufactured by slowly burning suitable oils and tars in a restricted supply of air. The smoke, carried by natural draft, passes into a series of settling chambers in which the black collects on the walls and floors and is periodically removed.

An important black produced for many years in Germany is made from coal tar residues such as naphthalene and anthracene oils. Vapors of these oils are used to enrich water gas (CO and $H_2$), and the mixture is then burned from slotted pipes so that the smoky flames impinge on cooled rollers. The products are very similar to American channel grade rubber blacks.

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# Natural Gas

By R. F. Zaffarano [1] and Ivan F. Avery [2]

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## GENERAL SUMMARY

THE NATURAL gas industry, sixth in the Nation in term of plant investment continued to provide the major share of fuel growth in total energy supply.

Marketed production reached a record 15,547 billion cubic feet.

Total consumption in 1964 was 15,536 billion cubic feet, an increase of 696 million cubic feet over the 1963 level. The average value of natural gas at the wellhead was 15.4 cents per Mcf.

## SCOPE OF REPORT

Data on natural gas production, consumption, and value are collected by annual surveys of oil and gas producers, natural-gasoline-plant operators, gas-pipeline companies, and gas-utility companies. Separate reports are obtained from respondents for each State in which they operate.

Gas volumes reported by the Bureau of Mines are calculated to a pressure base of 14.65 pounds per square inch absolute (psia) at 60° F.

The reports received reflected approximately 80 percent of gross natural gas production. The large number of respondents and the difficulty of canvassing each small producer has made direct acquisition of total production impractical. Most of the output of nonreporting producers has been shown in purchase listings of reporting

[1] Petroleum engineer, Division of Petroleum.
[2] Mineral specialist (petroleum), Division of Statistics.



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companies. Marketed production for each State equals consumption in the State, plus losses in transmission, plus gas placed in storage, plus shipments to other States, less gas withdrawn from storage, less receipts from other States.

## TRENDS AND DEVELOPMENTS

All trends in the natural gas industry depict growth, but at declining rates. Gas consumption increased more than 10 percent per year from 1950 to 1955, about 8.3 percent annually between 1955 and 1960, and 5.5 percent per year from 1960 to 1964 for a record high of 15.5 trillion cubic feet in 1964 (table 1). Gas companies continued to diversify, to venture into foreign investments, and to improve efficiency of their operations for increased earnings.

## MARKETED PRODUCTION

The total marketed production of natural gas was 15.5 trillion cubic feet (table 1), an increase of nearly 800 billion cubic feet from that of 1963. The 1964 marketed production was almost double that of 1954—reflecting an annual growth rate of 6.6 percent per year over the 10-year period.

Gas distribution and transmission systems are continuing to be expanded to keep pace with the increased gas demand in the nation. Distribution lines are increasing rapidly because of increased space-heating loads as well as other domestic use in suburban areas.

TABLE 1.—Salient statistics of natural gas in the United States

| | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Supply: | | | | | |
| Marketed production [1] million cubic feet | 12,771,038 | 13,254,025 | 13,876,622 | 14,746,663 | 15,546,592 |
| Withdrawn from storage do | 712,658 | 698,050 | 854,336 | 916,720 | 885,307 |
| Imports do | 155,646 | 218,860 | 401,534 | 406,204 | 443,326 |
| Total do | 13,639,342 | 14,170,935 | 15,132,492 | 16,069,587 | 16,875,225 |
| Disposition: | | | | | |
| Consumption do | 12,509,427 | 13,081,714 | 13,890,129 | 14,640,480 | 15,536,373 |
| Exports do | 11,332 | 10,747 | 15,814 | 16,967 | 19,603 |
| Stored do | 844,352 | 843,666 | 940,823 | 1,047,492 | 1,014,814 |
| Lost in transmission, etc. do | 274,231 | 234,808 | 285,726 | 364,658 | 304,435 |
| Total do | 13,639,342 | 14,170,935 | 15,132,492 | 16,069,587 | 16,875,225 |
| Value at wellhead: | | | | | |
| Total thousand dollars | 1,789,970 | 1,996,241 | 2,145,301 | 2,328,030 | 2,387,689 |
| Average cents per Mcf | 14.0 | 15.1 | 15.5 | 15.8 | 15.4 |

[1] Comprises nonprocessed gas sold or consumed by products, including losses in transmission, amounts added to storage, and increases in gas in pipelines.

Underground storage facilities have been developed by pipeline and distribution companies; these have been additions of major significance to the pipeline network for load-balancing. These facilities continued to increase in 1964. In 1952, 151 storage fields were in 16 States, having a total capacity of 1.3 trillion cubic feet. By 1964 underground storage capacity had grown to 3.9 trillion cubic feet stored in 286 reservoirs in 24 States. Underground storage in 1964 is

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capable of meeting approximately one-third of the peak-day loads of distribution companies in most of the large market areas.

The short term projection of atomic energy as a competitive source of fuel energy has not developed as rapidly as expected by some prognosticators. Consequently, the present stage of development of atomic power plants for public utility service that has been termed embryonic may be expected to be continued, and natural gas will continue to be the major mineral fuel in the U.S. economy.

As reported in the American Gas Association Heating Survey an additional 1.1 million customers installed gas heating in 1964, which increased the gas househeating customers to more than 25 million, about 4.5 percent more than in 1963. In addition to these, 2.3 million multifamily dwellings, such as apartments, received gas heat from a central source. About two-thirds of the new customers for services of utility companies were in new homes, the remainder represented those converting from other fuels in existing dwellings. Illinois, Indiana, Michigan, Ohio, and Wisconsin continued to lead the Nation in growth of househeating customers, based primarily on conversions from other fuels.

The gaseous and liquid hydrocarbon industries in 1964 were faced with a fast-developing competition for energy markets by the electric utility industry. At the end of 1963, about 1.5 million homes were heated electrically. In 1964, such installations increased approximately to 2.0 million and are forecast to rise to 2.5 million in 1965. The New England and mid-Atlantic areas of the United States showed the largest increase in electrically heated homes, predominantly in multifamily dwellings.

## LEGISLATION AND GOVERNMENT PROGRAMS

### DOMESTIC

The Federal Power Commission is the prime governmental regulatory agency administering the Natural Gas Act enacted by the Congress in 1938. The purpose of the act, as interpreted by the Supreme Court, is to underwrite just and reasonable rates to consumers of natural gas so as to afford them a complete, permanent, and effective bond of protection from excessive rates and changes.

The act grants the Commission comprehensive regulatory authority over wholesale gas rates and the accounting and depreciation practices of the natural gas companies engaged in interstate commerce, as well as jurisdiction over the export of natural gas from and import into the United States.

On January 9, 1964, the Federal Power Commission issued a ruling that the rate of return of a gas producing affiliate for an interstate pipeline company should be based on standards used for pipeline production generally and not on those applicable to independent producers.[2]

In a case involving Florida Gas Transmission Co., the Federal Power Commission on June 8, 1964, ordered the company to eliminate

[2] Federal Power Commission Annual Report, 1964. FPC A–90, p. 23.

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from its rate base more than $8 million representing profits to affiliated engineering and construction companies.[4] The Commission found that these groups were in a position where they could control the action of the pipeline company in awarding contracts for building the line and that they exercised this control in favor of their own firms. "The Commission ruling follows its policy of preventing insiders from taking advantage of their position and creating costs which are not subject to the check of ordinary business relationships."

## FOREIGN

**Canada.**—Policy decisions of the Alberta Oil and Gas Conservation Board in 1964 supported future expansion in the Canadian natural gas industry. A significant feature of the export decisions of the Board was removal of an additional 4.8 trillion cubic feet of gas from Alberta, reducing the remaining surplus beyond domestic needs to less than 1 trillion cubic feet. Therefore, the industry will need to accelerate gas exploration to discover more gas to support future export demand.

**United Kingdom.**—Under the Continental Shelf Act of 1964, the United Kingdom acquired sovereign rights over a designated 100,000 square miles of the North Sea Shelf. This act gives the Crown any rights exercisable by the United Kingdom outside territorial waters for the seabed and subsoil and their natural resources. Both exploration and production licenses are granted by the Minister of Power to United Kingdom nationals or registered companies. If natural gas is discovered, its use in or transmission to Great Britain will not be approved unless the gas is to be used for nonfuel purposes and the appropriate Area Gas Board has been given an opportunity to purchase the gas.

**Netherlands.**—The Netherlands Government regulations on mineral development are somewhat unusual in that all minerals belong to the Government, and permits are not required to conduct exploration work. Concessions can only be applied for after the discovery has been made. Unusual leasing procedures have discouraged operators other than Netherlands Petroleum Co. (NAM) from working in Netherlands. However, with the discovery at Groningen in 1959 at least 13 other companies are exploring for natural gas, chiefly in the northern part of the country. Limited preliminary exploration in offshore Dutch waters took place in 1964, pending the establishment of new mining legislation by the Dutch Government.

Final agreement on the Continental Shelf delimitation between Netherlands and West Germany was signed in December 1964. This agreement established the border line between the Dutch and German area of the Continental Shelf to the 54th parallel without setting a precedent for the final national frontier. Fixing boundaries in the central district of the North Sea will require future multilateral negotiation between West Germany, Netherlands, United Kingdom, Norway, and Denmark.

[4] Work cited in footnote 3, p. 24.

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## RESERVES

At the end of 1964, the American Gas Association (AGA) Committee on Natural Gas Reserves reported that proved recoverable natural gas reserves of the United States reached a new high of 281.3 trillion cubic feet (table 2), 5 trillion cubic feet more than the gas reserves at the beginning of the year. During the past 14 years, as shown, national gas reserves have increased from 185 to 281 trillion cubic feet (fig. 2) to meet the rapidly expanding energy requirements of the United States. The disposition of the annual estimates of natural gas reserves for the 1950–64 period by type of gas reservoir is given in figure 2. A slight growth in nonassociated gas reserves has occurred within the past 5 years (table 2). This growth has resulted from the deeper exploratory drilling required for new discoveries, which generally produces gas in this nonassociated category.

The annual gross additions to gas reserves for the period 1947–64, including new field discoveries as well as extensions of old fields and revisions of previous estimates are given in figure 1. In 1956, the peak year in exploratory drilling and best discovery year, 24.8 trillion cubic feet were proved, motivated by the Suez Canal situation. Likewise, the low number of exploratory wells drilled in 1954 (fig. 1) is attributed to the termination of the Korean War and overcapacity within the petroleum industry. The sharp decline in gross additions to gas reserves from 1959 to 1960 resulted from the aftermath of the 1958

**TABLE 2.—Estimated proved recoverable reserves of natural gas in the United States**

(Million cubic feet—14.73 psi at 60° F)

| State | Reserves as of December 31, 1963 [1] | Changes in reserves during 1964 | | | |
|---|---|---|---|---|---|
| | | Extensions and revisions [1] | Discoveries of new fields and new pools in old fields [1] | Net change in underground storage [2] | Net production [3] |
| Alaska | 1,690,724 | 146,058 | 1,000 | 0 | 6,417 |
| Arkansas | 1,792,644 | 286,586 | 97,780 | 7,165 | 84,083 |
| California [4] | 8,865,726 | 672,499 | 141,808 | 11,598 | 637,924 |
| Colorado | 1,876,057 | −64,438 | 18,050 | 1,313 | 101,724 |
| Illinois | 168,595 | −128 | 80 | 17,301 | 6,347 |
| Indiana | 60,180 | 2,264 | 46 | 12,048 | 3,270 |
| Kansas | 17,994,235 | 42,157 | 57,134 | 2,579 | 817,963 |
| Kentucky | 1,085,236 | 5,217 | 68,776 | 9,578 | 74,452 |
| Louisiana [4] | 75,364,992 | 4,915,365 | 2,950,060 | 121 | 4,154,229 |
| Michigan | 722,812 | 44,293 | 14,309 | 23,566 | 30,704 |
| Mississippi | 2,481,627 | 58,306 | 10,250 | 581 | 195,000 |
| Montana | 598,131 | 6,660 | 2,176 | 11,397 | 28,095 |
| Nebraska | 100,042 | −534 | 2,771 | 3,035 | 11,931 |
| New Mexico | 15,037,822 | 1,116,604 | 85,800 | 598 | 886,389 |
| New York | 132,285 | −1,147 | 1,360 | 3,785 | 2,794 |
| North Dakota | 1,119,575 | 19,420 | 7,884 | 0 | 36,234 |
| Ohio | 748,187 | −22,378 | 6,000 | 15,325 | 37,713 |
| Oklahoma | 19,138,820 | 1,586,206 | 239,688 | 149 | 1,207,628 |
| Pennsylvania | 1,214,498 | 60,555 | 14,560 | 30,284 | 85,322 |
| Texas [4] | 117,809,376 | 4,403,407 | 3,074,409 | 4,112 | 6,436,249 |
| Utah | 1,638,324 | −65,955 | 12,058 | 64 | 65,088 |
| Virginia | 31,303 | 0 | 2,800 | 0 | 1,923 |
| West Virginia | 2,311,164 | 175,859 | 27,353 | 30,022 | 196,453 |
| Wyoming | 3,988,546 | −53,775 | 70,062 | −880 | 235,393 |
| Other States [5] | 180,332 | 736 | 3,087 | 11,370 | 3,703 |
| Total | 276,151,233 | 13,342,837 | 6,909,301 | 195,111 | 15,347,028 |

See footnotes at end of table.

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**TABLE 2.—Estimated proved recoverable reserves of natural gas in the United States—Continued**

| State | Reserves as of December 31, 1964 | | | | |
|---|---|---|---|---|---|
| | Nonassociated [6] | Associated [7] | Dissolved [8] | Underground storage [9] | Total |
| Alaska | 1,748,527 | 0 | 82,838 | 0 | 1,831,365 |
| Arkansas | 1,569,426 | 317,722 | 189,191 | 23,753 | 2,100,092 |
| California [4] | 3,354,184 | 1,647,953 | 3,849,350 | 202,220 | 9,053,707 |
| Colorado | 1,399,949 | 79,323 | 244,421 | 5,565 | 1,729,258 |
| Illinois | 72 | 0 | 35,047 | 144,382 | 179,501 |
| Indiana | 607 | 597 | 16,883 | 53,181 | 71,268 |
| Kansas | 16,578,324 | 428,220 | 178,777 | 92,821 | 17,278,142 |
| Kentucky | 982,153 | 0 | 66,978 | 45,224 | 1,094,355 |
| Louisiana [4] | 65,012,415 | 9,175,211 | 4,887,971 | 712 | 79,076,309 |
| Michigan | 151,853 | 73,709 | 53,663 | 495,051 | 774,276 |
| Mississippi | 1,907,408 | 179,547 | 262,256 | 6,553 | 2,355,764 |
| Montana | 384,278 | 21,122 | 78,165 | 106,704 | 590,269 |
| Nebraska | 56,484 | 8,169 | 15,352 | 13,378 | 93,383 |
| New Mexico | 11,463,976 | 2,114,892 | 1,749,048 | 26,519 | 15,354,435 |
| New York | 38,288 | 0 | 31 | 95,170 | 133,489 |
| North Dakota | 6,372 | 328,340 | 775,933 | 0 | 1,110,645 |
| Ohio | 228,818 | 0 | 89,278 | 391,325 | 709,421 |
| Oklahoma | 14,963,987 | 2,700,233 | 1,959,732 | 133,283 | 19,757,235 |
| Pennsylvania | 703,957 | 0 | 18,104 | 521,514 | 1,243,575 |
| Texas [4] | 80,457,781 | 25,010,649 | 13,309,782 | 76,843 | 118,855,055 |
| Utah | 882,146 | 382,106 | 254,299 | 852 | 1,519,403 |
| Virginia | 32,180 | 0 | 0 | 0 | 32,180 |
| West Virginia | 1,936,618 | 0 | 61,202 | 350,125 | 2,347,945 |
| Wyoming | 3,223,793 | 151,545 | 372,687 | 20,535 | 3,768,560 |
| Other States [5] | 38,764 | 0 | 19,005 | 134,053 | 191,822 |
| Total | 207,122,360 | 42,619,338 | 28,509,993 | 2,939,763 | 281,251,454 |

[1] Excludes gas loss due to natural gas liquids recovery.
[2] Net difference between gas stored in and gas withdrawn from underground storage reservoirs, including adjustments and native gas transferred from other reserves categories.
[3] Net production equals gross withdrawals less gas injected into producing reservoirs. Changes in underground storage and gas loss due to natural gas liquids recovery are excluded. Fourth quarter production estimated in some instances.
[4] Includes offshore reserves.
[5] Includes Alabama, Arizona, Florida, Iowa, Maryland, Missouri, Tennessee and Washington.
[6] Free gas not in contact with crude oil in the reservoir and free gas in contact with oil, where the production of such gas is not significantly affected by the production of crude oil.
[7] Free gas in contact with crude oil in the reservoir where the production of such gas is significantly affected by the production of crude oil.
[8] Gas in solution with crude oil in the reservoirs.
[9] Gas held in underground reservoirs (including native and net injected gas) for storage.

Source: Committee on Natural Gas Reserves, American Gas Association.

recession when the industry experienced stringent cutbacks in exploration. The 17-year record of the new additions to proved gas reserves, (fig. 1), exhibits an overall increasing trend.

The reserves added each year by extensions and revisions have been roughly twice the reserve added by new discoveries, which is related to the procedure used to estimate total reserves of a field in the year of its discovery. Satisfactory estimates can only be made following sufficient field development whereby adequate production history is available for reserve estimation. For these reasons, the reserves listed as discovered during any current year must be considered only as the reserves estimates indicated by the drilling in that year.

Effective December 31, 1963, the standard conditions for reporting natural gas reserves estimated by the AGA Committee on Nature Gas Reserves were changed from 14.65 psia to 14.73 psia at 60° F.

Gross additions to natural gas reserves in 1964, were more than 20 trillion cubic feet for the sixth time in the past 17 years. About 39 percent of this increase occurred within onshore and offshore Louisiana, and more than 80 percent of these new reserves were non-associ-

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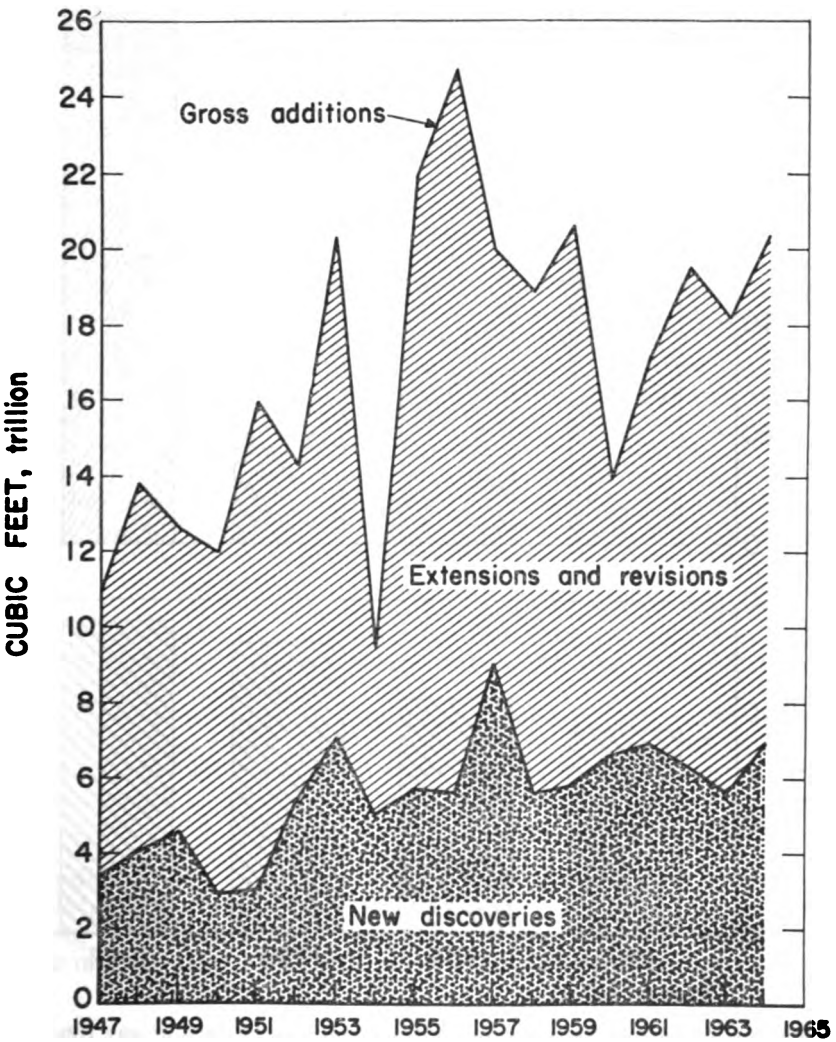
ated gas. About 74 percent of all natural gas reserves were contained within non-associated gas reservoirs (table 2). Texas, the major gas supply State, contained 27 percent of the national additions to reserves.




Source : A.G.A.

FIGURE 1.—Trends in annual gross additions to natural gas reserves, trillion cubic feet, 1947–64.

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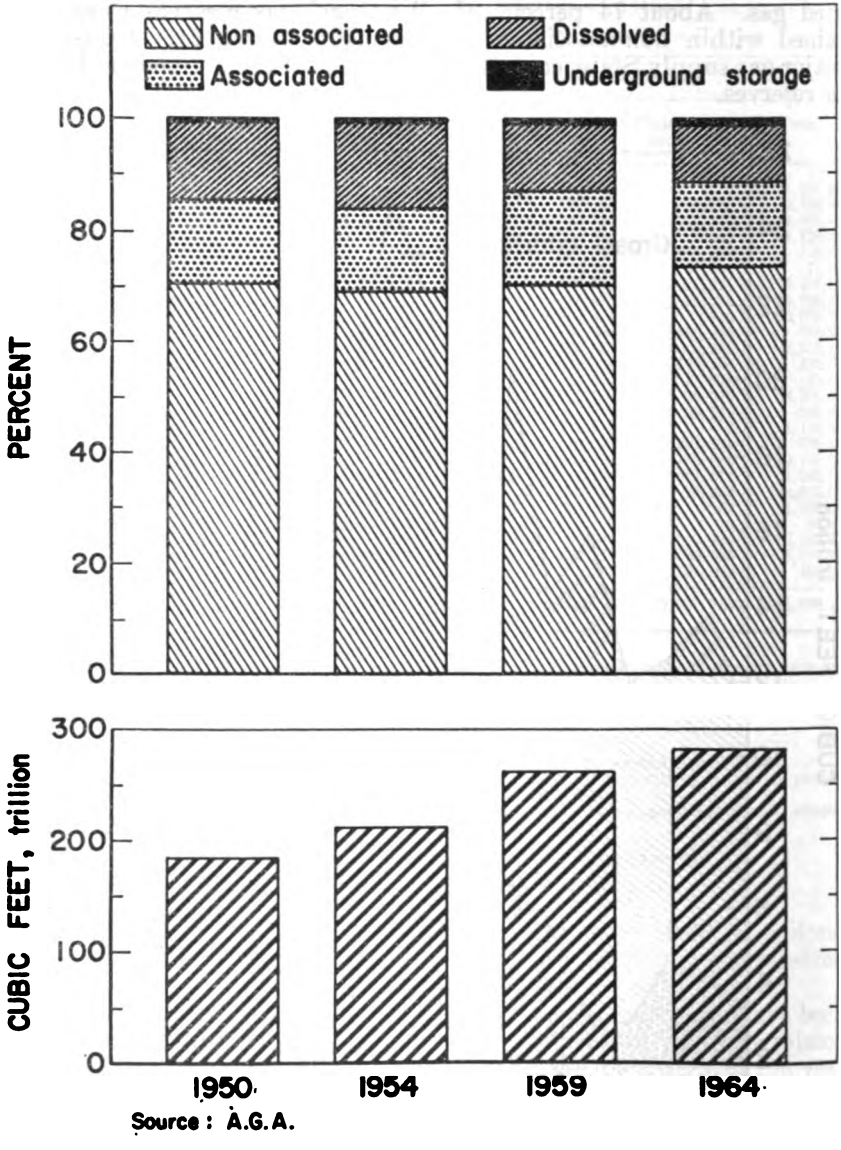


FIGURE 2.—Annual estimates of natural gas reserves by type of gas reservoir, cubic feet, 1950–64.

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## DOMESTIC PRODUCTION

### GROSS WITHDRAWAL

Gross withdrawal represents the sum of marketed production, which comprises gas sold or consumed by producers, including loss due to natural gas liquids recovery (shrinkage); loss in transmission, amount added to storage; and increases in gas pipeline, gas repressured—which includes gas returned to formations, used for pressure maintenance and cycling; and gas vented and flared. Total withdrawals from gas wells and oil wells are estimated from annual Bureau of Mines Supply and Distribution Surveys (fig. 3). The quantity of gas vented and flared is compiled from company data reported to the Bureau of Mines. The data are supplemented by estimates of losses derived from figures published by the Natural Gas Reserves Committee of the American Gas Association and State conservation bodies.

Total gross withdrawals of 17.5 trillion cubic feet include all gas withdrawn; however, not all is included in the marketed production figure of 15.5 trillion cubic feet, representing the quantity entering the gas market. The remaining 2.0 trillion cubic feet was reinjected in the producing formation, vented, and flared.

The amount of gas produced from gas wells and oil wells is shown in table 3. The proportion of total gas production coming from gas wells has increased since 1935, and in 1964 was approximately 75 percent, with the remainder derived from oil wells. This increase in gas resulted from deeper drilling to reach productive formations, which generally contain more gas.

The amount of gas returned to formation (table 3) decreased 196 billion cubic feet to 1.6 trillion cubic feet from the 1963 level. The amount vented and flared (partly estimated) was 341 billion cubic feet, an 11.0 percent decrease from 1963.

Marketed production of natural gas in the United States in 1964 was 15.5 trillion cubic feet, 5.4 percent more than in 1963 (table 4). From 1960 to 1964 (figs. 3 and 4, table 4) the total marketed production increased 4.9 percent per year. Gas used for repressuring and cycling remained relatively unchanged, and gas vented and flared continued to decline at the rate of 13 percent per year.

Production of natural gas, while occurring in at least 29 states, is concentrated mainly in the West South Central States. Texas is the leading State in marketed production. It has been the leading producer in the Nation since 1929, when it displaced Oklahoma.

### STORAGE

Storage gas near consuming centers is proving to be a successful method of handling seasonal peak requirements to gas transmission systems. Often this storage is supplemented with some type of standby facility, such as manufactured and mixed gases of liquefied natural gas. Economics govern the choice to shave peaks during high demand periods. When the transmission line is relatively short it may be more economical to build sufficient capacity into the line to deliver peak requirements. In other instances, involving long trans-

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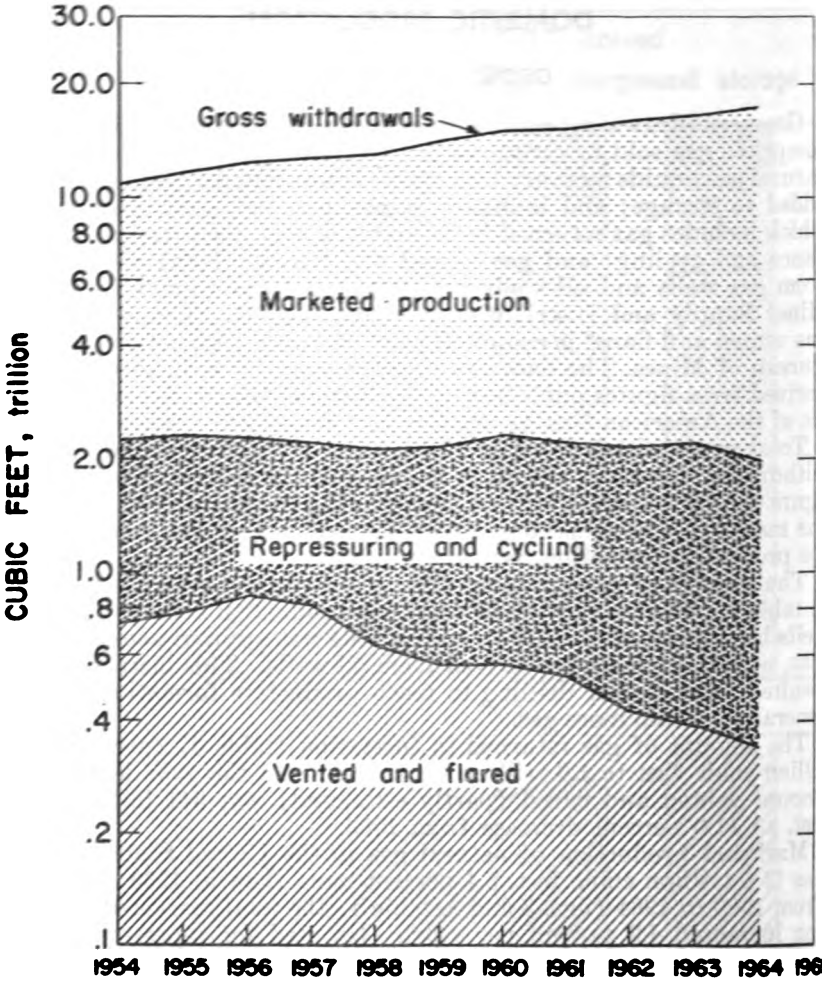


FIGURE 3.—Gross withdrawals and disposition of natural gas in the United States, trillion cubic feet, 1954–64.

mission lines and extreme demand flucuation, terminal storage is preferred.

Approximately 1.0 trillion cubic feet (table 5) were injected as input to underground storage. The volume of gas withdrawn from storage was 885 billion cubic feet, a net increase of 130 billion cubic feet (fig. 5), which equals the 1963 net stored volume. The 1950–64 trend in net gas stored in the United States (fig. 5) indicates an increasing trend at a decreasing rate, an overall growth rate of 6.5 percent per year for the period. The increase in net gas stored for the 1959–64 period was at the reduced rate of 1.8 percent per year. It is not uncommon on peak days for more than 80 percent of the gas sendout deliveries to be taken from storage to meet gas requirements.

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**TABLE 3.—Gross withdrawals and disposition of natural gas in the United States**

(Million cubic feet)

| State | Gross withdrawals | | | Disposition | | |
|---|---|---|---|---|---|---|
| | From gas wells [1] | From oil wells [1] | Total [2] | Marketed production [3] | Repressuring | Vented and flared [4] |
| 1963: | | | | | | |
| Alaska | 8,100 | 2,800 | 10,900 | 4,498 | 6,316 | 86 |
| Arkansas | 57,700 | 41,500 | 99,200 | 76,101 | 19,191 | 3,908 |
| California | 281,200 | 668,300 | 949,500 | 646,486 | 297,413 | 5,601 |
| Colorado | 65,400 | 79,500 | 144,900 | 105,705 | 35,070 | 4,125 |
| Illinois | 1,900 | 7,700 | 9,600 | 9,459 | | 141 |
| Indiana | 300 | 3,300 | 3,600 | 286 | | 3,314 |
| Kansas | 718,000 | 50,000 | 768,000 | 732,946 | 155 | 34,899 |
| Kentucky | 71,700 | 3,000 | 74,700 | 74,634 | | 66 |
| Louisiana | 3,540,100 | 710,000 | 4,250,100 | 3,928,427 | 212,116 | 109,557 |
| Maryland | 1,633 | | 1,633 | 1,633 | | |
| Michigan | 25,200 | 10,400 | 35,600 | 32,850 | 1,640 | 1,110 |
| Mississippi | 138,100 | 92,100 | 230,200 | 176,807 | 45,368 | 8,025 |
| Montana | 23,400 | 8,000 | 31,400 | 30,026 | 598 | 776 |
| Nebraska | 8,200 | 6,100 | 14,300 | 13,051 | | 1,249 |
| New Mexico | 528,000 | 298,400 | 826,400 | 808,377 | 11,814 | 6,209 |
| New York | 3,800 | 200 | 4,000 | 3,962 | | 38 |
| North Dakota | 1,100 | 38,800 | 39,900 | 32,798 | 3,034 | 4,068 |
| Ohio | 33,500 | 5,000 | 38,500 | 36,817 | | 1,683 |
| Oklahoma | 850,900 | 496,100 | 1,347,000 | 1,233,883 | 62,203 | 50,914 |
| Pennsylvania | 90,200 | 3,000 | 93,200 | 92,657 | 204 | 339 |
| Texas | 5,769,300 | 1,683,000 | 7,452,300 | 6,205,034 | 1,114,288 | 132,978 |
| Utah | 26,600 | 67,000 | 93,600 | 77,122 | 13,771 | 2,707 |
| Virginia | 2,085 | | 2,085 | 2,085 | | |
| West Virginia | 207,000 | 3,400 | 210,400 | 210,223 | 116 | 61 |
| Wyoming | 151,000 | 89,500 | 240,500 | 209,060 | 20,000 | 11,440 |
| Other States [5] | 1,604 | 246 | 1,850 | 1,736 | | 114 |
| Total | 12,606,022 | 4,367,346 | 16,973,368 | 14,746,663 | 1,843,297 | 383,408 |
| 1964: | | | | | | |
| Alaska | 8,800 | 3,200 | 12,000 | 6,272 | 5,479 | 249 |
| Arkansas | 59,200 | 42,100 | 101,300 | 76,167 | 21,480 | 3,653 |
| California | 290,300 | 629,200 | 919,500 | 664,051 | 244,310 | 11,139 |
| Colorado | 71,900 | 74,900 | 146,800 | 114,312 | 28,293 | 4,195 |
| Illinois | 1,100 | 6,900 | 8,000 | 7,867 | | 133 |
| Indiana | 100 | 2,500 | 2,600 | 200 | | 2,400 |
| Kansas | 744,200 | 41,000 | 785,200 | 768,246 | 11 | 16,943 |
| Kentucky | 70,900 | 6,500 | 77,400 | 77,360 | | 40 |
| Louisiana | 3,702,300 | 812,700 | 4,515,000 | 4,175,412 | 222,477 | 117,111 |
| Maryland | 1,381 | | 1,381 | 1,381 | | |
| Michigan | 21,200 | 12,700 | 33,900 | 31,558 | 1,624 | 718 |
| Mississippi | 128,700 | 89,100 | 217,800 | 181,414 | 27,315 | 9,071 |
| Montana | 19,400 | 7,500 | 26,900 | 25,188 | 606 | 1,106 |
| Nebraska | 7,500 | 5,200 | 12,700 | 11,155 | | 1,545 |
| New Mexico | 594,700 | 298,200 | 892,900 | 878,720 | 9,196 | 4,984 |
| New York | 3,100 | 100 | 3,200 | 3,125 | | 75 |
| North Dakota | 1,000 | 45,100 | 46,100 | 34,700 | 5,687 | 5,713 |
| Ohio | 31,800 | 6,000 | 37,800 | 37,309 | 98 | 393 |
| Oklahoma | 926,100 | 497,200 | 1,423,300 | 1,323,390 | 68,937 | 30,973 |
| Pennsylvania | 80,200 | 2,500 | 82,700 | 82,166 | 222 | 312 |
| Texas | 5,914,700 | 1,707,300 | 7,622,000 | 6,525,649 | 978,964 | 117,387 |
| Utah | 45,900 | 52,600 | 98,500 | 80,175 | 16,655 | 1,670 |
| Virginia | 1,609 | | 1,609 | 1,609 | | |
| West Virginia | 201,500 | 2,500 | 204,000 | 203,872 | 111 | 17 |
| Wyoming | 176,400 | 83,500 | 259,900 | 232,878 | 15,562 | 11,460 |
| Other States [5] | 2,074 | 438 | 2,512 | 2,416 | | 96 |
| Total | 13,106,064 | 4,428,938 | 17,535,002 | 15,546,592 | 1,647,027 | 341,383 |

[1] Estimated from the annual Bureau of Mines Supply and Distribution, Natural Gas Survey.
[2] Marketed production plus quantities used in repressuring, vented, and flared.
[3] Comprises gas sold or consumed by producers, including gas loss due to natural gas liquids recovery, losses in transmission, quantities added to storage, and increases in gas in pipelines.
[4] Partly estimated: Includes direct losses on producing properties and residue blown to the air.
[5] Alabama, Arizona, Florida, Missouri, South Dakota, and Tennessee.



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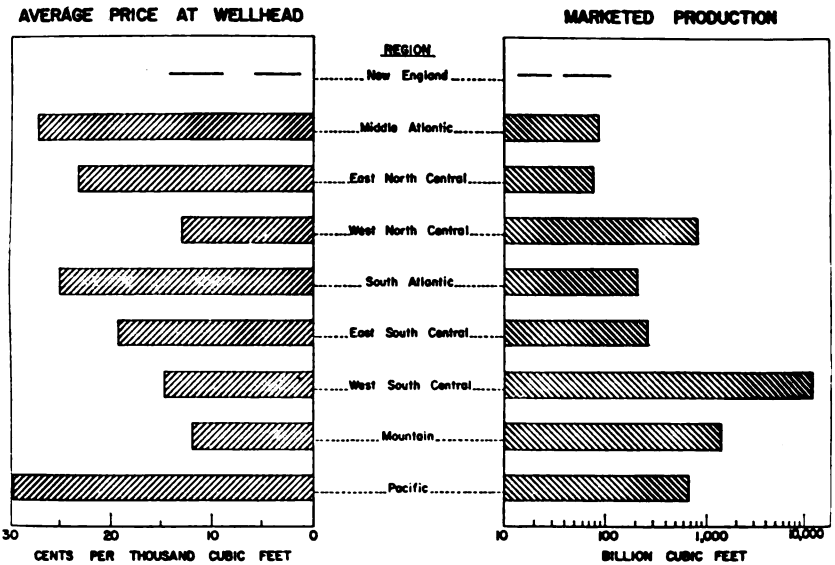


FIGURE 4.—Marketed production of natural gas by regions and average wellhead price.

TABLE 4.—Marketed production of natural gas in the United States[1]

| State | Quantity (million cubic feet) | | | | | Change from 1963 (percent) | Estimated value at wells (thousand dollars) | |
|---|---|---|---|---|---|---|---|---|
| | 1960 | 1961 | 1962 | 1963 | 1964 | | 1963 | 1964 |
| Alabama | 57 | 56 | 128 | 177 | 166 | −6.2 | 21 | 18 |
| Alaska | 246 | 631 | 2,184 | 4,498 | 6,272 | 39.4 | 1,111 | 1,719 |
| Arizona | | | 230 | 1,334 | 2,025 | 51.8 | 161 | 241 |
| Arkansas | 55,451 | 59,547 | 66,213 | 76,101 | 76,167 | 0.1 | 11,796 | 11,806 |
| California | 517,535 | 556,241 | 564,220 | 646,486 | 664,051 | 2.7 | 189,420 | 198,551 |
| Colorado | 107,404 | 108,142 | 101,826 | 105,705 | 114,312 | 8.1 | 12,367 | 13,489 |
| Florida | 30 | 29 | 29 | 35 | 40 | 14.3 | 7 | 5 |
| Illinois | 11,666 | 9,970 | 10,650 | 9,459 | 7,867 | −16.8 | 1,220 | 905 |
| Indiana | 342 | 382 | 284 | 286 | 200 | −30.1 | 67 | 47 |
| Kansas | 634,410 | 649,083 | 694,352 | 732,946 | 768,246 | 4.8 | 97,482 | 96,031 |
| Kentucky | 75,329 | 70,937 | 70,241 | 74,634 | 77,360 | 3.7 | 17,838 | 18,257 |
| Louisiana | 2,988,414 | 3,271,857 | 3,525,456 | 3,928,427 | 4,175,412 | 6.3 | 777,829 | 793,328 |
| Maryland | 4,065 | 3,578 | 2,472 | 1,633 | 1,381 | −15.4 | 439 | 366 |
| Michigan | 20,790 | 27,697 | 28,987 | 32,850 | 31,558 | −3.9 | 8,902 | 7,964 |
| Mississippi | 172,478 | 172,543 | 170,271 | 176,807 | 181,414 | 2.6 | 31,825 | 31,385 |
| Missouri | 75 | 90 | 92 | 100 | 108 | 8.0 | 27 | 26 |
| Montana | 33,418 | 33,901 | 29,955 | 30,026 | 25,188 | −16.1 | 2,253 | 1,965 |
| Nebraska | 15,258 | 15,743 | 14,880 | 13,051 | 11,155 | −14.5 | 2,454 | 1,707 |
| New Mexico | 798,928 | 789,662 | 804,612 | 808,377 | 878,720 | 8.7 | 96,197 | 101,932 |
| New York | 4,990 | 5,742 | 4,262 | 3,962 | 3,125 | −21.1 | 1,169 | 963 |
| North Dakota | 19,483 | 20,100 | 25,155 | 32,798 | 34,700 | 5.8 | 6,264 | 7,634 |
| Ohio | 36,074 | 36,423 | 36,747 | 36,817 | 37,309 | 1.3 | 8,909 | 8,880 |
| Oklahoma | 824,266 | 892,697 | 1,060,717 | 1,233,883 | 1,323,390 | 7.3 | 160,405 | 166,747 |
| Pennsylvania | 113,928 | 100,427 | 90,053 | 92,657 | 82,166 | −11.3 | 24,091 | 22,349 |
| Tennessee | 63 | 71 | 75 | 90 | 77 | −14.4 | 17 | 15 |
| Texas | 5,892,704 | 5,963,605 | 6,080,210 | 6,205,034 | 6,525,649 | 5.2 | 775,629 | 809,180 |
| Utah | 51,040 | 57,175 | 74,128 | 77,122 | 80,175 | 4.0 | 14,036 | 10,904 |
| Virginia | 2,227 | 2,466 | 2,499 | 2,085 | 1,609 | −22.8 | 488 | 479 |
| West Virginia | 208,757 | 210,556 | 210,698 | 210,223 | 203,872 | −3.0 | 55,919 | 50,968 |
| Wyoming | 181,610 | 194,674 | 204,996 | 209,060 | 232,878 | 11.4 | 29,687 | 29,608 |
| Total | 12,771,038 | 13,254,025 | 13,876,622 | 14,746,663 | 15,546,592 | 5.4 | 2,328,030 | 2,387,689 |

[1] Comprises gas either sold or consumed by producers, including gas loss due to natural gas liquids recovery, losses in transmission, quantities added to storage, and increases of gas in pipelines.

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**TABLE 5.—Natural gas stored underground in and withdrawn from storage fields**

(Million cubic feet)

| State | 1963 | | | 1964 | | |
|---|---|---|---|---|---|---|
| | Total stored | Total withdrawn | Net stored | Total stored | Total withdrawn | Net stored |
| Arkansas | 71,728 | 1,037 | 691 | 1,552 | 920 | 632 |
| California | 73,556 | 46,768 | 26,788 | 72,878 | 61,916 | 10,962 |
| Colorado | 2,220 | 851 | 1,369 | 3,837 | 2,530 | 1,307 |
| Delaware | 401 | 329 | 72 | 440 | 390 | 50 |
| Illinois | 69,954 | 57,078 | 12,876 | 49,403 | 31,926 | 17,477 |
| Indiana | 22,516 | 12,841 | 9,675 | 23,420 | 11,997 | 11,423 |
| Iowa | 33,777 | 25,379 | 8,398 | 39,811 | 27,720 | 12,091 |
| Kansas | 40,791 | 40,353 | 438 | 42,753 | 38,719 | 4,034 |
| Kentucky | 18,863 | 19,000 | −137 | 19,428 | 15,856 | 3,572 |
| Michigan | 153,008 | 128,651 | 24,357 | 170,967 | 154,488 | 16,479 |
| Mississippi | 3,567 | 3,467 | 100 | 4,569 | 3,994 | 575 |
| Missouri | 10,093 | 7,179 | 2,914 | 7,156 | 5,207 | 1,949 |
| Montana | 18,529 | 5,594 | 12,935 | 17,083 | 5,691 | 11,392 |
| Nebraska | 457 | 716 | −259 | 5,147 | 2,036 | 3,111 |
| New Jersey | | | | 798 | 1,103 | −305 |
| New Mexico | 5,414 | 7,354 | −1,940 | 6,574 | 5,073 | 1,501 |
| New York | 43,223 | 42,297 | 926 | 38,624 | 33,617 | 5,007 |
| Ohio | 138,757 | 127,029 | 11,728 | 131,615 | 123,677 | 7,938 |
| Oklahoma | 30,435 | 26,067 | 4,368 | 21,971 | 22,611 | −640 |
| Pennsylvania | 195,513 | 194,890 | 623 | 197,684 | 180,313 | 17,371 |
| Texas | 26,313 | 25,244 | 1,069 | 29,505 | 25,114 | 4,391 |
| Utah | 1,284 | 1,088 | 196 | 644 | 577 | 67 |
| Virginia | | 16 | −16 | | | |
| West Virginia | 154,297 | 140,325 | 13,972 | 126,478 | 125,755 | 723 |
| Wyoming | 2,796 | 3,167 | −371 | 2,477 | 4,077 | −1,600 |
| Total | 1,047,492 | 916,720 | 130,772 | 1,014,814 | 885,307 | 129,507 |

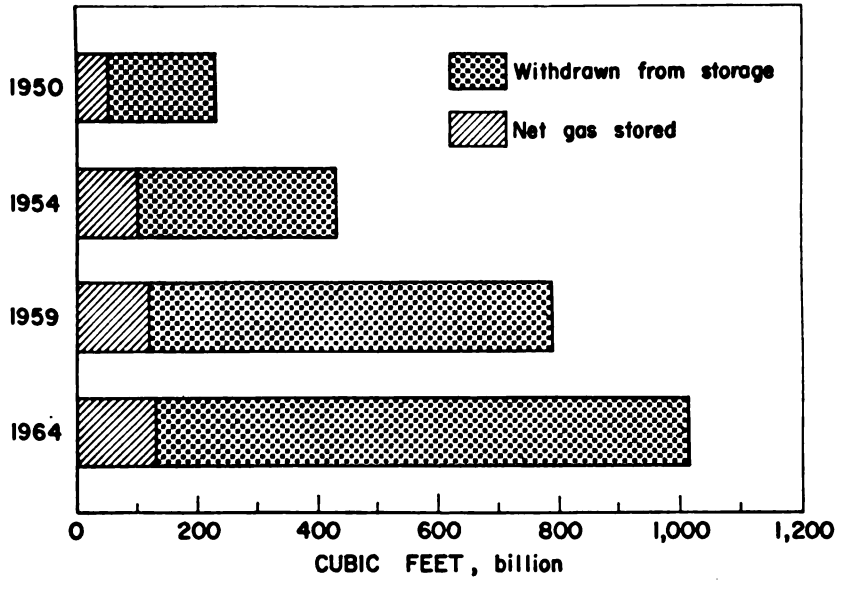


FIGURE 5.—Trends in net gas stored underground in U.S. storage fields, 1950–64.

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Underground storage areas for the U.S. gas industries increased to 286 pools, involving 11,566 wells with a total reservoir capacity of 3.9 trillion cubic feet (table 6). These former dry gas productive reservoirs serve as giant banks from which gas can be withdrawn during cold weather and deposited as storage in summer. Capital investments for storage sites totaled more than $1.2 billion. Gas storage in water sands (aquifers) is rapidly developing, and approximately 11 percent of the storage pools were of this type—representing about 6 percent of the total storage capacity.

As shown in the American Gas Association 1964 report (table 6), Pennsylvania is the leading storage State—having 693 billion cubic feet of capacity. Michigan, Ohio, West Virginia, California, Illinois, and Oklahoma are within the top seven storage States and contain approximately three-quarters of the gas storage. Devonian, Mississippian, and Pennsylvanian age geologic formations are the predominant storage reservoirs in use. Effective December 31, 1964, 2.3 trillion cubic feet of gas excluding native gas was in storage, utilizing about 59 percent of the available storage capacity.

**TABLE 6.—Underground storage statistics, December 31, 1964**

**(Million cubic feet—14.73 psi at 60° F)**

| State | Number of pools | Number of active wells | Total gas in storage reservoirs (million cubic feet) | Total reservoir capacity (million cubic feet) |
|---|---|---|---|---|
| Arkansas | 6 | 25 | 16,069 | 23,753 |
| California | 6 | 143 | 130,650 | 281,950 |
| Colorado | 2 | 18 | 4,197 | 7,937 |
| Illinois | 13 | 541 | 134,433 | 280,245 |
| Indiana | 19 | 591 | 42,220 | 53,429 |
| Iowa | 5 | 154 | 109,033 | 154,876 |
| Kansas | 16 | 742 | 79,406 | 103,368 |
| Kentucky | 14 | 457 | 31,534 | 48,380 |
| Louisiana | 1 | 3 | 212 | 1,000 |
| Michigan | 25 | 1,707 | 260,686 | 530,462 |
| Mississippi | 2 | 27 | 6,047 | 6,916 |
| Missouri | 2 | 59 | 24,636 | 70,000 |
| Montana | 5 | 136 | 69,522 | 155,457 |
| Nebraska | 1 | 7 | 2,319 | 39,270 |
| New Mexico | 3 | 35 | 5,699 | 57,802 |
| New York | 15 | 722 | 87,238 | 108,430 |
| Ohio | 17 | 2,600 | 320,181 | 480,951 |
| Oklahoma | 10 | 99 | 117,213 | 253,201 |
| Pennsylvania | 69 | 2,104 | 492,438 | 692,709 |
| Texas | 13 | 111 | 58,248 | 92,326 |
| Utah | 1 | 9 | 852 | 918 |
| Washington | 1 | 14 | 384 | 20,000 |
| West Virginia | 38 | 1,253 | 306,073 | 416,066 |
| Wyoming | 2 | 9 | 13,600 | 62,628 |
| Total | 286 | 11,566 | 2,312,890 | 3,942,074 |

Source: American Gas Association.

The producing gas and condensate wells in the United States at yearend was 103,084 (table 7). Texas, West Virginia, and Pennsylvania are the leading States in gas wells and condensate wells containing more than 63 percent of the 1963 wells and 53 percent in 1964. The increase in total producing gas wells is the result of deeper development drilling to meet the increased gas demand.

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TABLE 7.—Gas wells and condensate wells in the United States

| State | Completed during 1963 [1] | Producing Dec. 31, 1963 | Completed during 1964 [1] | Producing Dec. 31, 1964 |
|---|---|---|---|---|
| Alabama | | 2 | | |
| Alaska | 5 | 10 | 2 | 13 |
| Arizona | 2 | 7 | 6 | 10 |
| Arkansas | 43 | 490 | 48 | 515 |
| California | 118 | 879 | 123 | 950 |
| Colorado | 93 | 501 | 70 | 560 |
| Illinois | 12 | 25 | 17 | 25 |
| Indiana | 8 | 285 | 2 | 280 |
| Kansas | 227 | 7,050 | 219 | 7,174 |
| Kentucky | 167 | 5,210 | 194 | 5,320 |
| Louisiana | 614 | 7,859 | 538 | 8,260 |
| Maryland | | 33 | | 16 |
| Michigan | 84 | 175 | 53 | 195 |
| Mississippi | 22 | 450 | 18 | 435 |
| Missouri | | 6 | | 6 |
| Montana | 15 | 905 | 16 | 869 |
| Nebraska | 1 | 44 | 2 | 41 |
| New Mexico | 281 | 7,150 | 340 | 7,306 |
| New York | 22 | 1,130 | 45 | 1,155 |
| North Dakota | | 31 | | 31 |
| Ohio | 217 | 7,128 | 288 | 7,160 |
| Oklahoma | 430 | 6,639 | 464 | 6,813 |
| Pennsylvania | 220 | 16,600 | 358 | 14,120 |
| Tennessee | | 30 | | 30 |
| Texas | 1,308 | 22,016 | 1,328 | 22,995 |
| Utah | 21 | 135 | 19 | 135 |
| Virginia | 2 | 98 | 2 | 100 |
| West Virginia | 791 | 17,500 | 652 | 17,960 |
| Wyoming | 53 | 578 | 51 | 610 |
| Total | 4,756 | 102,966 | 4,855 | 103,084 |

[1] Source: Oil and Gas Journal.

## CONSUMPTION

Consumption of natural gas has a predominant concentration in areas favoring certain types of industries. The primary reason for such market concentration is determined by availability of pipelines for transportation from source areas. Markets are increased as pipelines expand.

More than one-fifth of marketed natural gas in the Nation was consumed in Texas (table 8). The second ranking State in gas consumption was California, having 1.74 trillion cubic feet of gas. The large gas consumption in Texas, is attributed to the substantial volume used within the State in oil and gas fields, plant operation, and petroleum refineries.

Total gas consumption represented 99.9 percent of the total marketed production with the remainder in storage, exported, or lost in transmission. Louisiana and Texas led the Nation in the quantity of interstate gas shipments (table 8).

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**TABLE 8.—Marketed production, interstate shipments, and total consumption of natural gas in the United States [1]**

(Million cubic feet)

| State by region or country | Marketed production | | Interstate movements | | Transmission loss and unaccounted for | Change in underground storage | Consumption |
|---|---|---|---|---|---|---|---|
| | Quantity | Average value at wellhead (cents per Mcf) | Quantity shipped | Quantity received | | | |
| New England: | | | | | | | |
| Connecticut | | | | 37,650 | 148 | | 37,502 |
| Massachusetts | | | | 107,104 | 405 | | 106,699 |
| New Hampshire | | | | 4,086 | 273 | | 3,813 |
| Rhode Island | | | | 15,621 | 156 | | 15,465 |
| Total: | | | | | | | |
| 1964 | | | | 164,461 | 982 | | 163,479 |
| 1963 | | | | 153,893 | 2,316 | | 151,577 |
| Middle Atlantic: | | | | | | | |
| New Jersey | | | | 209,874 | 10,070 | −305 | 200,109 |
| New York | 3,125 | 30.8 | 741 | 531,118 | 14,667 | 5,007 | 513,828 |
| Pennsylvania | 82,166 | 27.2 | 65,445 | 537,494 | 29,567 | 17,371 | 607,277 |
| Total: | | | | | | | |
| 1964 | 85,291 | 27.3 | 66,186 | 1,378,486 | 54,304 | 22,073 | 1,321,214 |
| 1963 | 96,619 | 26.1 | 118,613 | 1,353,150 | 48,990 | 1,549 | 1,280,617 |
| East North Central: | | | | | | | |
| Illinois | 7,867 | 11.5 | 3,265 | 747,384 | 2,588 | 17,477 | 731,921 |
| Indiana | 200 | 23.5 | 3,299 | 349,648 | 1,408 | 11,423 | 333,718 |
| Michigan | 31,558 | 25.3 | | 493,665 | 8,116 | 16,479 | 500,628 |
| Ohio | 37,309 | 23.8 | 437 | 800,126 | 4,949 | 7,938 | 824,111 |
| Wisconsin | | | | 174,296 | 4,094 | | 170,202 |
| Total: | | | | | | | |
| 1964 | 76,934 | 23.2 | 7,001 | 2,565,119 | 21,155 | 53,317 | 2,560,580 |
| 1963 | 79,412 | 24.0 | 1,382 | 2,423,305 | 73,031 | 56,636 | 2,369,668 |
| West North Central: | | | | | | | |
| Iowa | | | | 254,253 | −1,472 | 12,091 | 243,634 |
| Kansas | 768,246 | 12.5 | 502,160 | 183,971 | 12,594 | 4,034 | 433,429 |
| Minnesota | | | | 237,116 | 140 | | 236,976 |
| Missouri | 108 | 24.3 | | 330,864 | 3,829 | 1,949 | 325,194 |
| Nebraska | 11,155 | 15.3 | | 155,651 | −529 | 3,111 | 164,224 |
| North Dakota | 34,700 | 22.0 | 11,108 | 3,100 | 460 | | 26,232 |
| South Dakota | | | | 27,477 | −162 | | 27,639 |
| Total: | | | | | | | |
| 1964 | 814,209 | 12.9 | 513,268 | 1,192,432 | 14,860 | 21,185 | 1,457,328 |
| 1963 | 778,895 | 13.6 | 676,270 | 1,269,409 | 33,598 | 11,491 | 1,326,945 |
| South Atlantic: | | | | | | | |
| Delaware | | | | 17,508 | 367 | 50 | 17,091 |
| District of Columbia | | | | 20,721 | 88 | | 20,633 |
| Florida | 40 | 13.3 | | 186,898 | 1,689 | | 185,249 |
| Georgia | | | | 207,643 | 952 | | 206,691 |
| Maryland | 1,381 | 26.5 | 223 | 87,521 | 1,866 | | 86,813 |
| North Carolina | | | | 70,654 | 2,121 | | 68,533 |
| South Carolina | | | | 82,015 | 3,299 | | 78,716 |
| Virginia | 1,609 | 29.8 | 1,605 | 91,683 | 2,615 | | 89,072 |
| West Virginia | 203,872 | 25.0 | 144,760 | 133,052 | 8,926 | 723 | 182,515 |
| Total: | | | | | | | |
| 1964 | 206,902 | 25.0 | 146,588 | 897,695 | 21,923 | 773 | 935,313 |
| 1963 | 213,976 | 26.6 | 232,687 | 950,605 | 24,589 | 14,028 | 893,277 |
| East South Atlantic: | | | | | | | |
| Alabama | 166 | 11.1 | 6 | 220,626 | −1,261 | | 222,047 |
| Kentucky | 77,360 | 23.6 | 55,666 | 172,282 | 4,624 | 3,572 | 185,780 |
| Mississippi | 181,414 | 17.3 | 130,624 | 208,137 | 6,329 | 575 | 252,023 |
| Tennessee | 77 | 19.0 | | 188,392 | 6,993 | | 181,476 |
| Total: | | | | | | | |
| 1964 | 259,017 | 19.2 | 186,296 | 789,437 | 16,685 | 4,147 | 841,326 |
| 1963 | 251,708 | 19.7 | 200,745 | 739,718 | 12,426 | −37 | 778,293 |

See footnotes at end of table.

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**TABLE 8.—Marketed production, interstate shipments, and total consumption of natural gas in the United States—Continued**

| State by region or country | Marketed production | | Interstate movements | | Transmission loss and unaccounted for | Change in underground storage | Consumption |
|---|---|---|---|---|---|---|---|
| | Quantity | Average value at wellhead (cents per Mcf) | Quantity shipped | Quantity received | | | |
| West South Central: | | | | | | | |
| Arkansas | 76,167 | 15.5 | 5,685 | 222,647 | 18,826 | 632 | 273,671 |
| Louisiana | 4,175,412 | 19.0 | 3,242,590 | 220,734 | 14,370 | ---------- | 1,139,186 |
| Oklahoma | 1,323,390 | 12.6 | 728,459 | 17,333 | 14,273 | —640 | 598,631 |
| Texas | 6,525,649 | 12.4 | 3,180,381 | 96,634 | 60,418 | 4,391 | 3,377,093 |
| Total: | | | | | | | |
| 1964 | 12,100,618 | 14.7 | 7,157,115 | 557,348 | 107,887 | 4,383 | 5,388,581 |
| 1963 | 11,443,445 | 15.1 | 6,657,636 | 544,111 | 100,110 | 6,128 | 5,223,682 |
| Mountain: | | | | | | | |
| Arizona | 2,025 | 11.9 | 1,230 | 163,646 | 1,871 | ---------- | 162,570 |
| Colorado | 114,312 | 11.8 | 52,254 | 176,923 | 1,349 | 1,307 | 236,325 |
| Idaho | ---------- | ---------- | ---------- | 29,259 | —1,566 | ---------- | 30,825 |
| Montana | 25,188 | 7.8 | 1,887 | 58,019 | 2,276 | 11,392 | 67,652 |
| Nevada | ---------- | ---------- | ---------- | 24,004 | 76 | ---------- | 23,928 |
| New Mexico | 878,720 | 11.6 | 650,481 | 47,147 | 16,712 | 1,501 | 257,173 |
| Utah | 80,175 | 13.6 | 28,098 | 73,232 | 5,617 | 67 | 119,625 |
| Wyoming | 232,878 | 12.8 | 174,008 | 7,509 | 420 | —1,600 | 67,559 |
| Total: | | | | | | | |
| 1964 | 1,333,298 | 11.9 | 907,958 | 579,739 | 26,755 | 12,667 | 965,657 |
| 1963 | 1,231,624 | 12.6 | 795,788 | 539,975 | 35,725 | 12,189 | 927,897 |
| Pacific: | | | | | | | |
| Alaska | 6,272 | 27.4 | ---------- | ---------- | 491 | ---------- | 5,781 |
| California | 664,051 | 29.9 | ---------- | 1,130,068 | 45,816 | 10,962 | 1,737,341 |
| Oregon | ---------- | ---------- | ---------- | 52,699 | —1,285 | ---------- | 53,984 |
| Washington | ---------- | ---------- | ---------- | 100,651 | —5,138 | ---------- | 105,789 |
| Total: | | | | | | | |
| 1964 | 670,323 | 29.9 | ---------- | 1,283,418 | 39,884 | 10,962 | 1,902,895 |
| 1963 | 650,984 | 29.3 | ---------- | 1,098,202 | 33,874 | 26,788 | 1,688,524 |
| Total United States: | | | | | | | |
| 1964 | 15,546,592 | 15.4 | 8,984,412 | 9,408,135 | 304,435 | 129,507 | 15,536,373 |
| 1963 | 14,746,663 | 15.8 | 8,683,121 | 9,072,368 | 364,658 | 130,772 | 14,640,480 |
| Foreign: | | | | | | | |
| Canada | ---------- | ---------- | 390,721 | 9,763 | ---------- | ---------- | ---------- |
| Mexico | ---------- | ---------- | 52,605 | 9,840 | ---------- | ---------- | ---------- |
| Grand total movements:[1] | | | | | | | |
| 1964 | ---------- | ---------- | 9,427,738 | 9,427,738 | ---------- | ---------- | ---------- |
| 1963 | ---------- | ---------- | [2]9,089,325 | [3]9,089,325 | ---------- | ---------- | ---------- |

[1] No shipments were made into Maine, Vermont, and Hawaii.
[2] Includes total Foreign shipments of 406,204 million cubic feet.
[3] Includes total Foreign receipts of 16,957 million cubic feet.

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## TABLE 9.—Natural gas moving interstate, imports, and exports

(Million cubic feet)

| State by region or country | Quantity received | Producing region | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Middle Atlantic | East North Central | West North Central | South Atlantic | East South Central | West South Central | Mountain | Canada | Mexico |
| New England: | | | | | | | | | | |
| Connecticut | 37,650 | 173 | 40 | ------- | 11 | 796 | 35,438 | ------- | ------- | 1,192 |
| Massachusetts | 107,104 | 443 | 103 | ------- | 28 | 2,042 | 101,432 | ------- | ------- | 3,056 |
| New Hampshire | 4,086 | ------- | ------- | ------- | ------- | ------- | 4,086 | ------- | ------- | ------- |
| Rhode Island | 15,621 | 92 | 21 | ------- | 6 | 423 | 14,448 | ------- | ------- | 631 |
| Total | 164,461 | 708 | 164 | ------- | 45 | 3,261 | 155,404 | ------- | ------- | 4,879 |
| Middle Atlantic: | | | | | | | | | | |
| New Jersey | 209,874 | 455 | 351 | ------- | 109 | 2,856 | 201,958 | ------- | ------- | 4,145 |
| New York | 531,118 | 51,662 | 192 | ------- | 9,068 | 5,110 | 457,032 | ------- | 2,078 | 5,976 |
| Pennsylvania | 637,494 | 1,168 | 1,064 | 4 | 49,366 | 14,657 | 555,703 | ------- | ------- | 15,532 |
| Total | 1,378,486 | 53,285 | 1,607 | 4 | 58,543 | 22,623 | 1,214,693 | ------- | 2,078 | 25,653 |
| East North Central: | | | | | | | | | | |
| Illinois | 747,384 | ------- | 101 | 32,464 | ------- | 133 | 712,769 | 1,005 | 297 | 615 |
| Indiana | 349,648 | ------- | 2,605 | 29,568 | ------- | 1,226 | 315,319 | 58 | ------- | 872 |
| Michigan | 493,665 | ------- | ------- | 41,286 | ------- | 662 | 451,046 | 199 | 205 | 267 |
| Ohio | 800,126 | 11,734 | 2,074 | 27,824 | 64,288 | 32,439 | 649,087 | 53 | ------- | 12,627 |
| Wisconsin | 174,296 | ------- | 117 | 10,069 | ------- | ------- | 97,824 | 1,694 | 64,588 | 4 |
| Total | 2,565,119 | 11,734 | 4,897 | 141,211 | 64,288 | 34,460 | 2,226,045 | 3,009 | 65,090 | 14,385 |
| West North Central: | | | | | | | | | | |
| Iowa | 254,253 | ------- | ------- | 53,427 | ------- | ------- | 191,745 | 9,051 | ------- | 30 |
| Kansas | 183,971 | ------- | ------- | 3 | ------- | ------- | 181,179 | 2,777 | ------- | 12 |
| Minnesota | 237,116 | ------- | ------- | 71,990 | ------- | ------- | 149,203 | 12,200 | 3,682 | 41 |
| Missouri | 330,864 | ------- | 165 | 103,396 | ------- | 14 | 226,500 | 29 | ------- | 760 |
| Nebraska | 155,651 | ------- | ------- | 65,045 | ------- | ------- | 68,783 | 21,806 | ------- | 17 |
| North Dakota | 3,100 | ------- | ------- | 140 | ------- | ------- | ------- | 366 | 2,594 | ------- |
| South Dakota | 27,477 | ------- | ------- | 8,021 | ------- | ------- | 11,634 | 7,818 | ------- | 4 |
| Total | 1,192,432 | ------- | 165 | 302,022 | ------- | 14 | 829,044 | 54,047 | 6,276 | 864 |
| South Atlantic: | | | | | | | | | | |
| Delaware | 17,508 | 3 | ------- | ------- | ------- | 38 | 17,465 | ------- | ------- | 2 |
| District of Columbia | 20,721 | 17 | 17 | ------- | 2,457 | 1,441 | 16,780 | ------- | ------- | 9 |
| Florida | 186,898 | ------- | ------- | ------- | ------- | 9,850 | 177,043 | ------- | ------- | 5 |
| Georgia | 207,643 | ------- | ------- | ------- | ------- | 36,081 | 171,555 | ------- | ------- | 7 |
| Maryland | 87,521 | 137 | 69 | ------- | 9,515 | 5,833 | 71,899 | ------- | ------- | 68 |
| North Carolina | 70,654 | ------- | ------- | ------- | ------- | ------- | 70,643 | ------- | ------- | 11 |
| South Carolina | 82,015 | ------- | ------- | ------- | ------- | 10,385 | 71,626 | ------- | ------- | 4 |
| Virginia | 91,683 | ------- | 64 | 12 | 9,384 | 5,714 | 76,498 | ------- | ------- | 11 |
| West Virginia | 133,052 | 302 | 14 | 2 | 1,480 | 7,291 | 123,894 | ------- | ------- | 69 |
| Total | 897,695 | 459 | 164 | 14 | 22,836 | 76,633 | 797,403 | ------- | ------- | 186 |
| East South Central: | | | | | | | | | | |
| Alabama | 220,626 | ------- | ------- | ------- | ------- | 35,601 | 184,656 | ------- | ------- | 369 |
| Kentucky | 172,282 | ------- | 4 | 1 | 876 | 537 | 169,701 | ------- | ------- | 1,163 |
| Mississippi | 208,137 | ------- | ------- | ------- | ------- | 175 | 207,231 | ------- | ------- | 731 |
| Tennessee | 188,392 | ------- | ------- | ------- | ------- | 210 | 187,123 | ------- | ------- | 1,059 |
| Total | 789,437 | ------- | 4 | 1 | 876 | 36,523 | 748,711 | ------- | ------- | 3,322 |
| West South Central: | | | | | | | | | | |
| Arkansas | 222,647 | ------- | ------- | ------- | ------- | 11 | 222,063 | ------- | ------- | 573 |
| Louisiana | 220,734 | ------- | ------- | ------- | ------- | 12,771 | 207,421 | ------- | ------- | 542 |
| Oklahoma | 17,333 | ------- | ------- | 817 | ------- | ------- | 16,328 | 188 | ------- | ------- |
| Texas | 96,634 | ------- | ------- | 8 | ------- | ------- | 71,535 | 22,890 | ------- | 2,201 |
| Total | 557,348 | ------- | ------- | 825 | ------- | 12,782 | 517,347 | 23,078 | ------- | 3,316 |

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**TABLE 9.—Natural gas moving interstate, imports, and exports—Continued**

| State by region or country | Quantity received | Producing region | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Middle Atlantic | East North Central | West North Central | South Atlantic | East South Central | West South Central | Mountain | Canada | Mexico |
| Mountain: | | | | | | | | | | |
| Arizona | 163,646 | | | | | | 66,701 | 96,945 | | |
| Colorado | 176,923 | | | 58,309 | | | 66,314 | 52,300 | | |
| Idaho | 29,259 | | | | | | | 28,912 | 347 | |
| Montana | 58,019 | | | 8,531 | | | | 21,974 | 27,514 | |
| Nevada | 24,004 | | | | | | 8,237 | 15,757 | 10 | |
| New Mexico | 47,147 | | | 1 | | | 44,015 | 3,131 | | |
| Utah | 73,232 | | | | | | | 73,232 | | |
| Wyoming | 7,509 | | | 943 | | | 1,834 | 4,732 | | |
| Total | 579,739 | | | 67,784 | | | 187,101 | 296,983 | 27,871 | |
| Pacific: | | | | | | | | | | |
| California | 1,130,068 | | | 69 | | | 464,891 | 519,803 | 145,305 | |
| Oregon | 52,699 | | | | | | | 9,249 | 43,450 | |
| Washington | 100,651 | | | | | | | | 100,651 | |
| Total | 1,283,418 | | | 69 | | | 464,891 | 529,052 | 289,406 | |
| Total United States | 9,408,135 | 66,186 | 7,001 | 511,930 | 146,588 | 186,296 | 7,140,639 | 906,169 | 390,721 | 52,605 |
| Foreign: | | | | | | | | | | |
| Canada | 9,763 | | | 1,338 | | | 8,327 | 98 | | |
| Mexico | 9,840 | | | | | | 8,149 | 1,691 | | |
| Total | 19,603 | | | 1,338 | | | 16,476 | 1,789 | | |
| Grand total | 9,427,738 | 66,186 | 7,001 | 513,268 | 146,588 | 186,296 | 7,157,115 | 907,958 | 390,721 | 52,605 |

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**TABLE 10.—Consumption of natural gas in the United States [1]**

| State by region | Quantity (million cubic feet) | | | | | Change from 1963 (percent) | Estimated value at point of consumption | |
|---|---|---|---|---|---|---|---|---|
| | 1960 | 1961 | 1962 | 1963 | 1964 | | 1963 | 1964 |
| **New England:** | | | | | | | | |
| Connecticut | 28,453 | 30,361 | 32,227 | 34,809 | 37,502 | 7.7 | 55,209 | 58,721 |
| Massachusetts | 77,886 | 81,768 | 89,015 | 98,447 | 106,699 | 8.4 | 145,529 | 171,858 |
| New Hampshire | 2,852 | 3,018 | 3,315 | 3,596 | 3,813 | 6.0 | 5,949 | 5,906 |
| Rhode Island | 11,839 | 12,780 | 13,794 | 14,725 | 15,465 | 5.0 | 22,723 | 23,296 |
| Total | 121,030 | 127,927 | 138,351 | 151,577 | 163,479 | 7.9 | 229,410 | 259,781 |
| **Middle Atlantic:** | | | | | | | | |
| New Jersey | 139,258 | 153,806 | 174,210 | 188,249 | 200,109 | 6.3 | 258,879 | 267,581 |
| New York | 419,460 | 435,417 | 474,384 | 506,942 | 513,828 | 1.4 | 559,543 | 573,371 |
| Pennsylvania | 520,788 | 529,716 | 550,080 | 585,426 | 607,277 | 3.7 | 467,638 | 500,545 |
| Total | 1,079,506 | 1,118,939 | 1,198,674 | 1,280,617 | 1,321,214 | 3.2 | 1,286,060 | 1,341,497 |
| **East North Central:** | | | | | | | | |
| Illinois | 536,549 | 574,346 | 620,309 | 658,432 | 731,921 | 11.2 | 509,572 | 535,676 |
| Indiana | 212,851 | 239,932 | 272,309 | 297,897 | 333,718 | 12.0 | 192,725 | 206,336 |
| Michigan | 368,531 | 407,732 | 443,677 | 463,667 | 500,628 | 8.0 | 381,533 | 405,434 |
| Ohio | 698,569 | 719,674 | 756,398 | 797,318 | 824,111 | 3.4 | 568,000 | 583,823 |
| Wisconsin | 90,620 | 113,679 | 136,516 | 152,354 | 170,202 | 11.7 | 136,589 | 142,038 |
| Total | 1,907,120 | 2,055,363 | 2,229,209 | 2,369,668 | 2,560,580 | 8.1 | 1,788,419 | 1,872,307 |
| **West North Central:** | | | | | | | | |
| Iowa | 187,138 | 204,663 | 213,552 | 219,005 | 243,634 | 11.2 | 124,253 | 134,115 |
| Kansas | 372,302 | 364,957 | 380,055 | 387,880 | 433,429 | 11.7 | 119,191 | 134,923 |
| Minnesota | 179,827 | 192,584 | 214,130 | 219,047 | 236,976 | 8.2 | 137,400 | 151,638 |
| Missouri | 261,372 | 274,487 | 289,482 | 303,075 | 325,194 | 7.3 | 169,147 | 187,653 |
| Nebraska | 139,028 | 143,169 | 146,043 | 149,014 | 164,224 | 10.2 | 69,135 | 76,634 |
| North Dakota | 17,274 | 19,625 | 22,196 | 23,765 | 26,232 | 10.4 | 9,662 | 10,841 |
| South Dakota | 24,533 | 25,820 | 27,413 | 25,159 | 27,639 | 9.9 | 15,518 | 17,019 |
| Total | 1,181,474 | 1,225,305 | 1,292,871 | 1,326,945 | 1,457,328 | 9.8 | 644,306 | 712,823 |
| **South Atlantic:** | | | | | | | | |
| Delaware | 9,035 | 9,380 | 14,492 | 16,378 | 17,091 | 4.4 | 14,971 | 15,413 |
| District of Columbia | 18,142 | 18,518 | 19,338 | 19,359 | 20,633 | 6.6 | 28,731 | 28,942 |
| Florida | 137,875 | 143,656 | 157,735 | 177,496 | 185,249 | 4.4 | 90,122 | 100,796 |
| Georgia | 182,087 | 179,957 | 192,638 | 187,600 | 206,691 | 10.2 | 120,080 | 129,673 |
| Maryland | 64,923 | 68,390 | 76,551 | 81,774 | 86,813 | 6.2 | 106,554 | 110,755 |
| North Carolina | 45,442 | 50,523 | 56,373 | 62,296 | 68,533 | 10.0 | 46,415 | 52,609 |
| South Carolina | 58,532 | 60,928 | 70,645 | 75,099 | 78,716 | 4.8 | 45,184 | 49,121 |
| Virginia | 66,181 | 70,579 | 77,254 | 83,011 | 89,072 | 7.3 | 85,575 | 85,566 |
| West Virginia | 179,969 | 192,221 | 188,602 | 190,264 | 182,515 | —4.1 | 103,684 | 101,841 |
| Total | 762,186 | 794,152 | 853,628 | 893,277 | 935,313 | 4.7 | 641,316 | 674,715 |
| **East South Central:** | | | | | | | | |
| Alabama | 184,118 | 184,909 | 194,369 | 205,763 | 222,047 | 7.9 | 112,688 | 118,395 |
| Kentucky | 159,710 | 161,912 | 168,138 | 175,928 | 185,780 | 5.6 | 97,858 | 101,346 |
| Mississippi | 188,864 | 190,930 | 199,733 | 227,184 | 252,023 | 10.9 | 76,305 | 84,398 |
| Tennessee | 155,623 | 160,667 | 167,737 | 169,418 | 181,476 | 7.1 | 89,045 | 87,787 |
| Total | 688,315 | 698,418 | 729,977 | 778,293 | 841,326 | 8.1 | 375,896 | 391,926 |
| **West South Central:** | | | | | | | | |
| Arkansas | 216,516 | 209,420 | 224,744 | 251,129 | 273,671 | 9.0 | 82,409 | 92,576 |
| Louisiana | 947,938 | 1,036,887 | 1,007,041 | 1,070,471 | 1,139,186 | 6.4 | 268,358 | 271,333 |
| Oklahoma | 383,042 | 378,096 | 485,726 | 588,245 | 598,631 | 1.8 | 151,723 | 153,227 |
| Texas | 2,981,167 | 3,030,914 | 3,209,968 | 3,313,837 | 3,377,093 | 1.9 | 707,973 | 766,425 |
| Total | 4,528,663 | 4,655,317 | 4,927,479 | 5,223,682 | 5,388,581 | 3.2 | 1,210,463 | 1,283,561 |

See footnote at end of table.

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**TABLE 10.—Consumption of natural gas in the United States [1]—Continued**

| State by region | Quantity (million cubic feet) | | | | | Change from 1963 (percent) | Estimated value at point of consumption | |
|---|---|---|---|---|---|---|---|---|
| | 1960 | 1961 | 1962 | 1963 | 1964 | | 1963 | 1964 |
| Mountain: | | | | | | | | |
| Arizona | 135,494 | 153,674 | 157,892 | 157,494 | 162,570 | 3.2 | 77,744 | 74,450 |
| Colorado | 207,646 | 212,611 | 204,940 | 207,663 | 236,325 | 13.8 | 81,611 | 99,219 |
| Idaho | 22,006 | 23,969 | 25,806 | 26,635 | 30,825 | 15.7 | 15,868 | 18,807 |
| Montana | 54,569 | 57,781 | 63,298 | 67,337 | 67,652 | 0.5 | 27,786 | 30,944 |
| Nevada | 12,447 | 15,864 | 17,528 | 19,292 | 23,928 | 24.0 | 14,279 | 15,556 |
| New Mexico | 266,409 | 288,455 | 292,495 | 275,969 | 257,173 | —6.8 | 66,645 | 64,176 |
| Utah | 75,650 | 81,879 | 92,890 | 103,628 | 119,625 | 15.4 | 44,716 | 50,027 |
| Wyoming | 59,635 | 61,451 | 67,336 | 69,879 | 67,559 | —3.3 | 15,994 | 17,822 |
| Total | 833,856 | 895,684 | 922,185 | 927,897 | 965,657 | 4.1 | 344,643 | 371,001 |
| Pacific: | | | | | | | | |
| Alaska | 229 | 557 | 2,137 | 4,214 | 5,781 | 37.2 | 3,128 | 4,120 |
| California | 1,311,253 | 1,405,882 | 1,476,322 | 1,554,126 | 1,737,341 | 11.8 | 887,674 | 1,003,699 |
| Oregon | 30,861 | 33,827 | 37,865 | 43,350 | 53,984 | 24.5 | 31,912 | 39,373 |
| Washington | 64,934 | 70,343 | 81,431 | 86,834 | 105,789 | 21.8 | 53,769 | 65,585 |
| Total | 1,407,277 | 1,510,609 | 1,597,755 | 1,688,524 | 1,902,895 | 12.7 | 976,483 | 1,112,777 |
| Total United States | 12,509,427 | 13,081,714 | 13,890,129 | 14,640,480 | 15,536,373 | 6.1 | 7,496,996 | 8,020,388 |

[1] Includes volume of natural gas which is distributed as a component of mixed gas.

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**Industrial Use.**—Gas consumed in the United States is given by principal use in figure 6 and table 11. The most gas consumption was for industrial use, 66.8 percent of the total. For industrial use, gas consumption is that generally described as "Other industrial—including electric utilities used," which consumed 6.9 trillion cubic feet (table 11).

Most of the subclassification for "other industrial" involves a wide variety of industrial uses, such as chemical and allied products, iron and steel, stone, clay, and glass, food and kindred products, paper and allied products, and nonferrous metals and their products. In 1964, the cement industry consumed 202 billion cubic feet of gas. Natural gas consumed for utility electric generation is consumed in the major gas-producing areas.

Field use ranked second for industrial gas consumption, 2.1 trillion cubic feet (fig. 6, table 11), 13.5 percent of the entire U.S. consumption. This includes gas used in oil and gas well drilling, pumping, shrinkage from natural gas processing plants, and gas consumed in operating natural gas extraction plants. Also included is gas consumed in artificial gaslift operations, that is, gas pumped into the casing of oil wells to aerate the oil column to assist ascent of the oil to the surface.

Natural gas used in the petroleum-refining industry, ranked third in industrial natural gas consumption. Refineries are often located near or adjacent to oil and gas fields, therefore, it is natural for them to turn to this source of fuel. Gas consumption within petroleum refineries has increased from 123 billion cubic feet in 1927 following World War I to more than 825 billion, an increase of 5.5 percent per year. The increase is the result of the greater availability of gas in the refinery area and in the increased number of refineries.

Natural gas consumption as a pipeline fuel continued on an increasing trend to 436 billion cubic feet (table 11). Among natural gas industrial consumers, carbon black plants—107 billion cubic feet (fig. 11)—were the smallest users, but ranked second before 1949. Since 1949, carbon black production has followed a decreasing trend because of increases in prices of natural gas from distress levels and development of oil furnace black which now appears to be a complete replacement for channel black. Oil feedstocks have an economic edge over gas furnace blacks and will capture more of the future carbon black market.

**Residential and Commercial.**—Both the residential and commercial classifications of natural gas consumption given in figure 6 and table 11 involve less concentrated markets than the industrial use, and in 1964 they included more than 37 million consumers.

The classifications of gas consumption indicate service to the comfort, heat, and power energy markets and show sensitive consideration of population, urbanization, and increased size of establishments. In 1964, increases in househeating and gas-air-conditioning markets insured continuation of the 14-year increased trend in home use of gas. Approximately 80 percent of all new U.S. dwellings used gas for heating, in contrast to 70 percent in 1950. Effective December 31, 1964, about 1.8 million tons of cooling capacity of gas-air-conditioning equipment was utilized, 20 percent more than the previous year. Of

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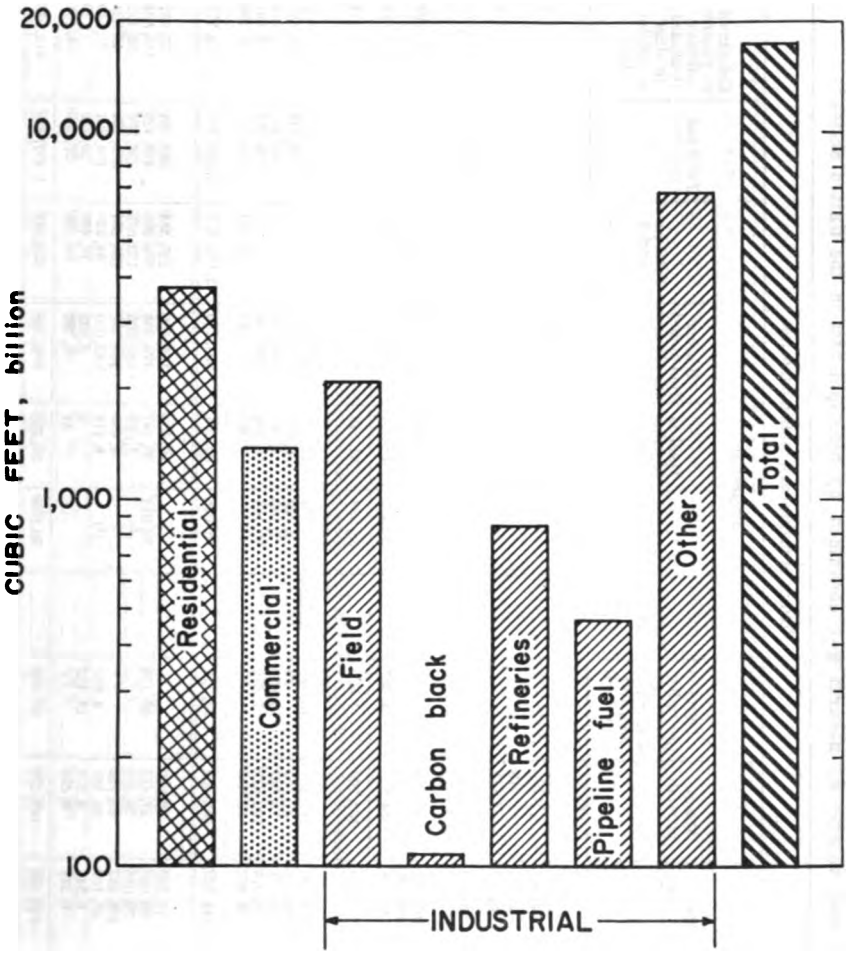


FIGURE 6.—Disposition of the natural gas consumed in United States by principal use, billion cubic feet.

this capacity, 15 percent was for residential use and the remainder for commercial and industrial consumption.

About 24.4 percent of the end-use gas consumption was by residential customers, and 8.8 percent by commerical customers (table 11). Within the East North Central States (table 11) were contained the largest number of customers. Consequently the greatest volume of gas was consumed within both residential and commercial classifications.

**Imports and Exports.**—Imports of 443.3 billion cubic feet of gas (table 8) from Canada and Mexico reflected a 9 percent increase from 1963, compared with a 5.4 percent growth in marketed production. Exports of natural gas to Canada and Mexico totaled 19.6 billion cubic feet, compared to 17 billion in 1963.

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**TABLE 11.—Number of consumers and volume of natural gas consumed by principal uses in the United States[1]**

| State by region | Number of consumers (thousands) | | Volume of natural gas, million cubic feet | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Industrial | | | | | | Total consumption | Consumed at electric utilities (included in other industrial use)[2] |
| | Residential | Commercial | Residential | Commercial | Field (pumping, drilling, extraction loss, and plant fuel) | Carbon black | Petroleum refineries | Used as pipeline fuel | All other fuel including electric utilities | Total industrial | | |
| New England: | | | | | | | | | | | | |
| Connecticut | 352 | 24 | 20,777 | 6,157 | | | | 103 | 10,465 | 10,568 | 37,502 | 396 |
| Massachusetts | 959 | 60 | 61,671 | 14,795 | | | | 194 | 30,039 | 30,233 | 106,699 | 13,128 |
| New Hampshire | 34 | 2 | 2,515 | 719 | | | | | 579 | 579 | 3,813 | |
| Rhode Island | 146 | 7 | 8,580 | 2,115 | | | | 101 | 4,669 | 4,770 | 15,465 | 438 |
| Total | 1,491 | 93 | 93,543 | 23,786 | | | | 398 | 45,752 | 46,150 | 163,479 | 13,962 |
| Middle Atlantic: | | | | | | | | | | | | |
| New Jersey | 1,495 | 107 | 106,911 | 21,373 | | | | 496 | 71,329 | 71,825 | 200,109 | 28,033 |
| New York | 3,774 | 278 | 269,594 | 81,142 | 433 | | | 2,799 | 159,860 | 163,092 | 513,828 | 77,410 |
| Pennsylvania | 2,088 | 135 | 251,708 | 64,688 | 1,087 | | 28,092 | 18,254 | 243,448 | 290,881 | 607,277 | 4,681 |
| Total | 7,357 | 520 | 628,213 | 167,203 | 1,520 | | 28,092 | 21,549 | 474,637 | 525,798 | 1,321,214 | 110,124 |
| East North Central: | | | | | | | | | | | | |
| Illinois | 2,429 | 153 | 314,930 | 102,291 | 16,592 | | 16,972 | 12,193 | 268,943 | 314,700 | 731,921 | 50,504 |
| Indiana | 844 | 77 | 108,011 | 37,521 | 33 | | 9,712 | 8,181 | 170,260 | 188,186 | 333,718 | 14,637 |
| Michigan | 1,667 | 133 | 250,971 | 74,367 | 4,698 | | 2,109 | 4,595 | 163,888 | 175,290 | 500,628 | 2,383 |
| Ohio | 2,254 | 175 | 402,014 | 120,872 | 1,885 | | 10,165 | 10,279 | 278,896 | 301,225 | 824,111 | 2,991 |
| Wisconsin | 619 | 44 | 68,463 | 19,283 | | | (3) | 1,313 | [3] 81,143 | 82,456 | 170,202 | 9,458 |
| Total | 7,813 | 582 | 1,144,389 | 354,334 | 23,208 | | 38,958 | 36,561 | 963,130 | 1,061,857 | 2,560,580 | 79,973 |
| West North Central: | | | | | | | | | | | | |
| Iowa | 518 | 64 | 71,753 | 36,327 | | | | 10,004 | 125,550 | 135,554 | 243,634 | 57,457 |
| Kansas | 563 | 51 | 86,049 | 37,412 | 49,179 | | 30,018 | 30,787 | 199,984 | 309,968 | 433,429 | 113,824 |
| Minnesota | 573 | 47 | 79,015 | 24,286 | | | (3) | 1,009 | [3] 132,666 | 133,675 | 236,976 | 53,112 |
| Missouri | 850 | 69 | 123,857 | 46,753 | | | | 8,452 | 146,132 | 154,584 | 325,194 | 46,824 |
| Nebraska | 334 | 46 | 45,107 | 24,187 | 4,662 | | (3) | 8,218 | [3] 82,050 | 94,930 | 164,224 | 37,540 |
| North Dakota | 41 | 5 | 5,542 | 4,221 | 13,432 | | | 2 | 3,035 | 16,469 | 26,232 | 20 |
| South Dakota | 66 | 9 | 9,311 | 8,493 | | | | 44 | 9,791 | 9,835 | 27,639 | 4,161 |
| Total | 2,945 | 291 | 420,634 | 181,679 | 67,273 | | 30,018 | 58,516 | 699,208 | 855,015 | 1,457,328 | 312,938 |
| South Atlantic: | | | | | | | | | | | | |
| Delaware | 68 | 4 | 5,255 | 1,092 | | | (3) | | [3] 10,744 | 10,744 | 17,091 | 3,852 |
| District of Columbia | (4) | (4) | (4) | (4) | | | | | (4) | (4) | (4) | |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Florida | 315 | 25 | 11,356 | 18,144 | 3,368 | | | 2,431 | 149,950 | 155,749 | 185,249 | 92,394 |
| Georgia | 635 | 50 | 69,942 | 26,693 | | | (5) | 4,606 | [5] 105,450 | 110,056 | 206,691 | 2,619 |
| Maryland | [4] 737 | [4] 58 | [4] 65,543 | [4] 16,626 | 10 | | | 1,166 | [4] 24,101 | [4] 25,277 | [4] 107,446 | 58 |
| North Carolina | 163 | 24 | 13,995 | 6,633 | | | | 4,151 | 43,754 | 47,905 | 68,533 | 2,212 |
| South Carolina | 198 | 19 | 11,577 | 6,273 | | | | 2,032 | 58,834 | 60,866 | 78,716 | 18,613 |
| Virginia | 388 | 43 | 34,399 | 13,438 | 47 | | | 6,560 | 34,628 | 41,235 | 89,072 | 1,828 |
| West Virginia | 331 | 30 | 51,841 | 14,952 | 21,439 | | 582 | 13,828 | 79,873 | 115,722 | 182,515 | 887 |
| Total | 2,835 | 253 | 263,908 | 103,851 | 24,864 | | 582 | 34,774 | 507,334 | 567,554 | 935,313 | 122,463 |
| East South Central: | | | | | | | | | | | | |
| Alabama | 548 | 42 | 51,351 | 34,343 | 141 | | 2,010 | 11,398 | 122,804 | 136,353 | 222,047 | 4,164 |
| Kentucky | 436 | 44 | 66,252 | 20,935 | 13,030 | | (5) | 25,315 | [3] 60,248 | 98,593 | 185,780 | 1,139 |
| Mississippi | 286 | 36 | 26,802 | 20,912 | 20,276 | | 4,078 | 39,439 | 140,516 | 204,309 | 252,023 | 50,486 |
| Tennessee | 371 | 45 | 36,569 | 28,212 | | | | 18,924 | 97,771 | 116,695 | 181,476 | 6,853 |
| Total | 1,641 | 167 | 180,974 | 104,402 | 33,447 | | 6,088 | 95,076 | 421,339 | 555,950 | 841,326 | 62,642 |
| West South Central: | | | | | | | | | | | | |
| Arkansas | 346 | 49 | 41,296 | 23,918 | 7,990 | | 10,757 | 11,388 | 178,322 | 208,457 | 273,671 | 64,419 |
| Louisiana | 739 | 62 | 70,658 | 26,313 | 230,435 | 21,642 | 108,539 | 43,073 | 638,526 | 1,042,215 | 1,139,186 | 158,804 |
| Oklahoma | 589 | 64 | 67,439 | 29,219 | 167,376 | | 46,090 | 8,086 | 280,421 | 501,973 | 598,631 | 122,529 |
| Texas | 2,245 | 237 | 193,093 | 81,350 | 1,208,747 | 65,438 | 442,586 | 66,254 | 1,319,625 | 3,102,650 | 3,377,093 | 605,725 |
| Total | 3,919 | 412 | 372,486 | 160,800 | 1,614,548 | 87,080 | 607,972 | 128,801 | 2,416,894 | 4,855,295 | 5,388,581 | 951,477 |
| Mountain: | | | | | | | | | | | | |
| Arizona | 337 | 34 | 28,329 | 22,741 | 171 | | | 17,358 | 93,971 | 111,500 | 162,570 | 49,429 |
| Colorado | 419 | 56 | 65,952 | 38,463 | 10,968 | | 1,682 | 1,290 | 117,970 | 131,910 | 236,325 | 37,635 |
| Idaho | 42 | 8 | 4,767 | 4,080 | | | 4,025 | 631 | 17,322 | 21,978 | 30,825 | |
| Montana | 121 | 20 | 18,895 | 13,131 | 5,322 | | | 1,290 | 29,014 | 35,626 | 67,652 | 2,450 |
| Nevada | 44 | 2 | 3,682 | 1,948 | | | | 103 | 18,195 | 18,298 | 23,928 | 12,242 |
| New Mexico | 182 | 27 | 22,372 | 12,462 | [3] 118,814 | (5) | 1,835 | 19,816 | 81,874 | 222,339 | 257,173 | 41,702 |
| Utah | 192 | 25 | 32,869 | 15,681 | 14,633 | | 6,650 | 297 | 49,495 | 71,075 | 119,625 | 4,009 |
| Wyoming | 65 | 9 | 10,183 | 8,647 | 26,126 | | 10,715 | 1,389 | 10,499 | 48,729 | 67,559 | 158 |
| Total | 1,402 | 181 | 187,049 | 117,153 | [3] 176,034 | (5) | 24,907 | 42,174 | 418,340 | 661,455 | 965,657 | 147,625 |
| Pacific: | | | | | | | | | | | | |
| Alaska | 5 | 1 | 1,045 | 1,925 | 1,031 | | | | 1,780 | 2,811 | 5,781 | 1,598 |
| California | 4,887 | 341 | 466,607 | 141,963 | [3] 171,154 | (5) | 75,298 | 16,592 | 865,727 | 1,128,771 | 1,737,341 | 518,766 |
| Oregon | 125 | 17 | 11,172 | 5,315 | | | | 473 | 37,024 | 37,497 | 53,984 | 321 |
| Washington | 155 | 26 | 17,272 | 12,306 | | | | 656 | 75,555 | 76,211 | 105,789 | |
| Total | 5,172 | 385 | 496,096 | 161,509 | [3] 172,185 | (5) | 75,298 | 17,721 | 980,086 | 1,245,290 | 1,902,895 | 520,685 |
| Total United States: | | | | | | | | | | | | |
| 1964 | 34,575 | 2,884 | 3,787,292 | 1,374,717 | [3] 2,093,400 | [3] 106,759 | [3] 825,473 | 435,570 | [3] 6,913,162 | 10,374,364 | 15,536,373 | 2,321,889 |
| 1963 | 33,451 | 2,788 | 3,589,021 | 1,267,783 | 2,081,339 | 117,378 | 789,951 | 423,783 | 6,371,225 | 9,783,676 | 14,640,480 | 2,142,930 |

[1] Includes natural gas which is distributed as component of mixed gas.
[2] Federal Power Commission, preliminary figures.
[3] 13,558 million cubic feet included in "Other industrial fuel", to avoid disclosure; included in U.S. "Refinery fuel" total.
[4] Included with Maryland to avoid disclosure.
[5] 19 679 million cubic feet included in "Field" to avoid disclosure; included in U.S. "Carbon black" total.



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## TABLE 12.—Value of natural gas at the point of consumption in the United States

| State by region | Value (thousand dollars) | | | | | | | Average value (cents per Mcf) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Industrial | | | | | | | Industrial | | | | |
| | Residential | Commercial | Field (pumping, drilling, extraction loss and plant fuel | Carbon black | All other, including electric utilities | Total industrial | Total consumption | Residential | Commercial | Field | Carbon black | All others, including electric utilities | Total | Total consumption |
| New England: | | | | | | | | | | | | | | |
| Connecticut | 39,258 | 9,190 | | | 10,273 | 10,273 | 58,721 | 188.9 | 149.3 | | | 97.2 | 97.2 | 156.6 |
| Massachusetts | 120,152 | 24,787 | | | 26,919 | 26,919 | 171,858 | 194.8 | 167.5 | | | 89.0 | 89.0 | 161.1 |
| New Hampshire | 4,294 | 1,119 | | | 493 | 493 | 5,906 | 170.7 | 155.6 | | | 85.1 | 85.1 | 154.9 |
| Rhode Island | 16,428 | 3,184 | | | 3,684 | 3,684 | 23,296 | 191.5 | 150.5 | | | 77.2 | 77.2 | 150.6 |
| Total | 180,132 | 38,280 | | | 41,369 | 41,369 | 259,781 | 192.6 | 160.9 | | | 89.6 | 89.6 | 158.9 |
| Middle Atlantic: | | | | | | | | | | | | | | |
| New Jersey | 207,107 | 26,531 | | | 33,943 | 33,943 | 267,581 | 193.7 | 124.1 | | | 47.3 | 47.3 | 133.7 |
| New York | 380,063 | 100,835 | 234 | | 92,239 | 92,473 | 573,371 | 141.0 | 124.3 | 54.0 | | 56.7 | 56.7 | 111.6 |
| Pennsylvania | 292,578 | 57,805 | 461 | | 149,701 | 150,162 | 500,545 | 116.2 | 89.4 | 42.4 | | 51.7 | 51.6 | 82.4 |
| Total | 879,748 | 185,171 | 695 | | 275,883 | 276,578 | 1,341,497 | 140.0 | 110.7 | 45.7 | | 52.6 | 52.6 | 101.5 |
| East North Central: | | | | | | | | | | | | | | |
| Illinois | 334,673 | 78,098 | 1,910 | | 120,995 | 122,905 | 535,676 | 106.3 | 76.3 | 11.5 | | 40.6 | 39.1 | 73.2 |
| Indiana | 102,528 | 31,617 | 5 | | 71,186 | 71,191 | 205,336 | 94.9 | 84.3 | 15.1 | | 37.8 | 37.8 | 61.5 |
| Michigan | 249,281 | 63,988 | 1,530 | | 90,635 | 92,165 | 405,434 | 99.3 | 86.0 | 32.6 | | 53.1 | 52.6 | 81.0 |
| Ohio | 331,497 | 89,988 | 678 | | 161,660 | 162,338 | 583,823 | 82.5 | 74.4 | 36.0 | | 54.0 | 53.9 | 70.8 |
| Wisconsin | 82,077 | 19,157 | | | 40,804 | 40,804 | 142,038 | 119.9 | 99.3 | | | 49.5 | 49.5 | 83.5 |
| Total | 1,100,056 | 282,848 | 4,123 | | 485,280 | 489,403 | 1,872,307 | 96.1 | 79.8 | 17.8 | | 46.7 | 46.1 | 73.1 |
| West North Central: | | | | | | | | | | | | | | |
| Iowa | 67,396 | 24,715 | | | 42,004 | 42,004 | 134,115 | 93.9 | 68.0 | | | 31.0 | 31.0 | 55.0 |
| Kansas | 49,263 | 15,393 | 6,200 | | 64,067 | 70,267 | 134,923 | 57.2 | 41.1 | 12.6 | | 24.6 | 22.7 | 31.1 |
| Minnesota | 85,574 | 19,925 | | | 46,139 | 46,139 | 151,638 | 108.3 | 82.0 | | | 34.5 | 34.5 | 64.0 |
| Missouri | 104,085 | 36,458 | | | 47,110 | 47,110 | 187,653 | 84.0 | 78.0 | | | 30.5 | 30.5 | 57.7 |
| Nebraska | 37,006 | 13,652 | 569 | | 25,407 | 25,976 | 76,634 | 82.0 | 56.4 | 12.2 | | 28.1 | 27.3 | 46.7 |
| North Dakota | 4,955 | 2,619 | 2,010 | | 1,257 | 3,267 | 10,841 | 89.4 | 62.0 | 15.0 | | 41.4 | 19.8 | 41.3 |
| South Dakota | 8,909 | 4,949 | | | 3,161 | 3,161 | 17,019 | 95.6 | 58.3 | | | 32.1 | 32.1 | 61.6 |
| Total | 357,188 | 117,711 | 8,779 | | 229,145 | 237,924 | 712,823 | 84.9 | 64.8 | 13.0 | | 29.1 | 27.8 | 48.9 |

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| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **South Atlantic:** | | | | | | | | | | | | | | |
| Delaware | 8,848 | 1,529 | | | 5,036 | 5,036 | 15,413 | 168.4 | 140.0 | | | 46.9 | 46.9 | 90.2 |
| District of Columbia | (1) | (1) | | | (1) | (1) | (1) | (1) | (1) | (1) | | (1) | (1) | (1) |
| Florida | 30,331 | 21,208 | 674 | | 48,582 | 49,256 | 100,795 | 267.1 | 116.9 | 20.0 | | 31.9 | 31.6 | 54.4 |
| Georgia | 72,018 | 18,683 | | | 38,972 | 38,972 | 129,673 | 103.0 | 70.0 | | | 35.4 | 35.4 | 62.7 |
| Maryland | 98,397 | 21,813 | 5 | | 19,482 | 19,487 | 139,697 | 150.1 | 131.2 | 50.0 | | 80.8 | 77.1 | 130.0 |
| North Carolina | 20,254 | 8,018 | | | 24,337 | 24,337 | 52,609 | 144.7 | 120.9 | | | 50.8 | 50.8 | 76.8 |
| South Carolina | 16,588 | 6,582 | | | 25,951 | 25,951 | 49,121 | 143.3 | 104.9 | | | 42.6 | 42.6 | 62.4 |
| Virginia | 50,954 | 15,176 | 21 | | 19,415 | 19,436 | 85,566 | 148.1 | 112.9 | 44.7 | | 47.1 | 47.1 | 96.1 |
| West Virginia | 43,314 | 10,330 | 5,977 | | 42,220 | 48,197 | 101,841 | 83.6 | 69.1 | 27.9 | | 44.8 | 41.6 | 55.8 |
| Total | 340,704 | 103,339 | 6,677 | | 223,995 | 230,672 | 674,715 | 129.1 | 99.5 | 26.9 | | 41.3 | 40.6 | 72.1 |
| **East South Central:** | | | | | | | | | | | | | | |
| Alabama | 57,890 | 18,751 | 53 | | 41,701 | 41,754 | 118,395 | 112.7 | 54.6 | 37.6 | | 30.6 | 30.6 | 53.3 |
| Kentucky | 53,266 | 14,144 | 2,461 | | 31,475 | 33,936 | 101,346 | 80.4 | 67.6 | 18.9 | | 36.8 | 34.4 | 54.6 |
| Mississippi | 22,515 | 10,316 | 3,654 | | 47,913 | 51,567 | 84,398 | 84.0 | 49.3 | 18.0 | | 26.0 | 25.2 | 33.5 |
| Tennessee | 33,509 | 19,754 | | | 34,434 | 34,434 | 87,787 | 91.9 | 70.0 | | | 29.5 | 29.5 | 48.4 |
| Total | 167,270 | 62,965 | 6,168 | | 155,523 | 161,691 | 391,926 | 92.4 | 60.3 | 18.4 | | 29.8 | 29.1 | 46.6 |
| **West South Central:** | | | | | | | | | | | | | | |
| Arkansas | 30,317 | 12,524 | 1,077 | | 48,658 | 49,735 | 92,576 | 73.4 | 52.4 | 13.5 | | 24.3 | 23.9 | 33.8 |
| Louisiana | 48,841 | 11,010 | 39,891 | 3,314 | 168,277 | 211,482 | 271,333 | 69.1 | 41.8 | 17.3 | 15.3 | 21.3 | 20.3 | 23.8 |
| Oklahoma | 48,951 | 14,658 | 17,939 | | 71,679 | 89,618 | 153,227 | 72.6 | 50.2 | 10.7 | | 21.4 | 17.9 | 25.6 |
| Texas | 162,307 | 45,604 | 182,748 | 7,948 | 367,818 | 558,514 | 766,425 | 84.1 | 56.1 | 15.1 | 12.1 | 20.1 | 18.0 | 22.7 |
| Total | 290,416 | 83,796 | 241,655 | 11,262 | 656,432 | 909,349 | 1,283,561 | 78.0 | 52.1 | 15.0 | 13.3 | 20.8 | 18.7 | 23.8 |
| **Mountain:** | | | | | | | | | | | | | | |
| Arizona | 26,659 | 12,173 | 22 | | 35,596 | 35,618 | 74,450 | 94.1 | 53.5 | 12.9 | | 32.0 | 31.9 | 45.8 |
| Colorado | 47,178 | 21,434 | 1,231 | | 29,376 | 30,607 | 99,219 | 71.5 | 55.7 | 11.2 | | 24.3 | 23.2 | 42.0 |
| Idaho | 6,085 | 3,886 | | | 8,836 | 8,836 | 18,807 | 127.6 | 95.2 | | | 40.2 | 40.2 | 61.0 |
| Montana | 14,420 | 6,995 | 347 | | 9,182 | 9,529 | 30,944 | 76.3 | 53.3 | 6.5 | | 30.3 | 26.7 | 45.7 |
| Nevada | 5,524 | 1,885 | | | 8,147 | 8,147 | 15,556 | 150.0 | 96.8 | | | 44.5 | 44.5 | 65.0 |
| New Mexico | 20,463 | 5,841 | [2] 13,040 | (2) | 24,832 | 37,872 | 64,176 | 91.5 | 46.9 | [2] 11.0 | (2) | 24.0 | 17.0 | 25.0 |
| Utah | 23,158 | 8,674 | 2,023 | | 16,172 | 18,195 | 50,027 | 70.5 | 55.3 | 13.8 | | 28.7 | 25.6 | 41.8 |
| Wyoming | 6,664 | 3,723 | 2,588 | | 4,847 | 7,435 | 17,822 | 65.4 | 43.1 | 9.9 | | 21.4 | 15.3 | 26.4 |
| Total | 150,151 | 64,611 | [2] 19,251 | (2) | 136,988 | 156,239 | 371,001 | 80.3 | 55.2 | [2] 10.9 | (2) | 28.2 | 23.6 | 38.4 |
| **Pacific:** | | | | | | | | | | | | | | |
| Alaska | 1,322 | 1,806 | 282 | | 710 | 992 | 4,120 | 126.5 | 93.8 | 27.4 | | 39.9 | 35.3 | 71.3 |
| California | 483,083 | 97,103 | [2] 51,219 | (2) | 372,294 | 423,513 | 1,003,699 | 103.5 | 68.4 | [2] 29.9 | (2) | 38.9 | 37.5 | 57.8 |
| Oregon | 16,780 | 7,461 | | | 15,132 | 15,132 | 39,373 | 150.2 | 140.4 | | | 40.4 | 40.4 | 72.9 |
| Washington | 23,614 | 14,159 | | | 27,812 | 27,812 | 65,585 | 136.7 | 115.1 | | | 36.5 | 36.5 | 62.0 |
| Total | 524,799 | 120,529 | [2] 51,501 | (2) | 415,948 | 467,449 | 1,112,777 | 105.8 | 74.6 | [2] 29.9 | (2) | 38.8 | 37.5 | 58.5 |
| Total: | | | | | | | | | | | | | | |
| 1964 | 3,990,464 | 1,059,250 | [2] 335,869 | [2] 14,242 | 2,620,563 | 2,970,674 | 8,020,388 | 105.4 | 77.1 | [2] 16.0 | [2] 13.3 | 32.1 | 28.6 | 51.6 |
| 1963 | 3,749,881 | 995,912 | 294,655 | 14,912 | 2,441,636 | 2,751,203 | 7,496,996 | 104.5 | 78.6 | 14.2 | 12.7 | 32.2 | 28.1 | 51.2 |

[1] Included with Maryland to avoid disclosure.
[2] $2,980,000 in value included in "Field" to avoid disclosure; included in "Carbon black" U.S.[total.

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**Value and Price.**—The average value of natural gas at point of consumption was residential, $1.05; commercial, $0.77; and industrial, $0.29 per Mcf (tables 12 and 13). The average value for total gas consumption was $0.51 per Mcf, essentially the same as in 1963.

For the first time in the history of this series, all wellhead values of natural gas (tables 1, 8, and 13) exclude all taxes to reflect the actual value of the gas at wellhead. Tax values deducted from wellhead prices amounted to $49.2 million; 90 percent came from reported data in the West South Central States. Consequently, the average value at wellhead shown (table 8) for this region appears to have decreased from 15.1 cents per Mcf in 1963 to 14.7 cents. This difference resulted from the change in basis of calculation and does not reflect a regional price variation.

**TABLE 13.—Average value of natural gas in the United States**

(Cents per thousand cubic feet)

| State | At wells (estimated) | | At point of consumption | | State | At wells (estimated) | | At point of consumption | |
|---|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | | 1963 | 1964 | 1963 | 1964 |
| Alabama | 11.8 | 11.1 | 54.8 | 53.3 | Nebraska | 18.8 | 15.3 | 46.4 | 46.7 |
| Alaska | 24.7 | 27.4 | 74.2 | 71.3 | Nevada | | | 74.0 | 65.0 |
| Arizona | 12.1 | 11.9 | 49.4 | 45.8 | New Hampshire | | | 165.4 | 154.9 |
| Arkansas | 15.5 | 15.5 | 32.8 | 33.8 | New Jersey | | | 137.5 | 133.7 |
| California | 29.3 | 29.9 | 57.1 | 57.8 | New Mexico | 11.9 | 11.6 | 24.1 | 25.0 |
| Colorado | 11.7 | 11.8 | 39.3 | 42.0 | New York | 29.5 | 30.8 | 110.4 | 111.6 |
| Connecticut | | | 158.6 | 156.6 | North Carolina | | | 74.5 | 76.8 |
| Delaware | | | 91.4 | 90.2 | North Dakota | 19.1 | 22.0 | 40.7 | 41.3 |
| District of Columbia | | | 148.4 | 140.3 | Ohio | 24.2 | 23.8 | 71.2 | 70.8 |
| Florida | 20.0 | 13.3 | 50.8 | 54.4 | Oklahoma | 13.0 | 12.6 | 25.8 | 25.6 |
| Georgia | | | 64.0 | 62.7 | Oregon | | | 73.6 | 72.9 |
| Idaho | | | 59.6 | 61.0 | Pennsylvania | 26.0 | 27.2 | 79.9 | 82.4 |
| Illinois | 12.9 | 11.5 | 77.4 | 73.2 | Rhode Island | | | 154.3 | 150.6 |
| Indiana | 23.4 | 23.5 | 64.7 | 61.5 | South Carolina | | | 60.2 | 62.4 |
| Iowa | | | 56.7 | 55.0 | South Dakota | | | 61.7 | 61.6 |
| Kansas | 13.3 | 12.5 | 30.7 | 31.1 | Tennessee | 18.9 | 19.0 | 52.6 | 48.4 |
| Kentucky | 23.9 | 23.6 | 55.6 | 54.6 | Texas | 12.5 | 12.4 | 21.4 | 22.7 |
| Louisiana | 19.8 | 19.0 | 25.1 | 23.8 | Utah | 18.2 | 13.6 | 43.2 | 41.8 |
| Maryland | 26.9 | 26.5 | 130.3 | 127.6 | Virginia | 23.4 | 29.8 | 103.1 | 98.1 |
| Massachusetts | | | 147.8 | 161.1 | Washington | | | 61.9 | 62.0 |
| Michigan | 27.1 | 25.3 | 82.3 | 81.0 | West Virginia | 26.6 | 25.0 | 54.5 | 55.8 |
| Minnesota | | | 62.7 | 64.0 | Wisconsin | | | 89.7 | 83.5 |
| Mississippi | 18.0 | 17.3 | 33.6 | 33.5 | Wyoming | 14.2 | 12.8 | 22.9 | 26.4 |
| Missouri | 27.0 | 24.3 | 55.8 | 57.7 | | | | | |
| Montana | 7.5 | 7.8 | 41.3 | 45.7 | Total | 15.8 | 15.4 | 51.2 | 51.6 |

Approximately 13.2 trillion cubic feet of natural gas (table 14) was processed in plants. During the 1960–64 period the quantity of gas processed has had a growth rate of 8.0 percent per year. Effective December 31, 1964, the operating capacity for gas-processing plants exceeded 65 million gallons per day, 9 percent more than the 1962 capacity. If present processing trends continue, refrigerated absorption plants may capture the largest share of future capacity.

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**TABLE 14.—Natural gas processed at natural gas processing plants in the United States**

(Million cubic feet)

| State | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Arkansas | 120,943 | 112,490 | 121,911 | 132,535 | 127,862 |
| California | 548,406 | 553,734 | 539,594 | 549,077 | 532,250 |
| Colorado | 84,322 | 96,177 | 83,643 | 121,043 | 117,910 |
| Illinois [1] | 194,679 | 198,964 | 197,180 | 199,877 | 196,907 |
| Kansas | 451,676 | 508,213 | 592,035 | 687,331 | 804,129 |
| Kentucky [1] [2] | 273,558 | 295,314 | 329,137 | 298,450 | 408,859 |
| Louisiana | 1,491,078 | 1,694,071 | 2,015,188 | 2,646,572 | 2,844,739 |
| Michigan | (2) | (2) | (2) | (2) | (2) |
| Mississippi | 131,369 | 108,156 | 95,486 | 90,459 | 82,775 |
| Montana [3] | 41,480 | 55,850 | 53,890 | 50,986 | 52,955 |
| Nebraska | [4] 41,663 | [4] 40,388 | [4] 34,837 | 10,667 | 10,393 |
| New Mexico | 662,479 | 665,602 | 732,421 | 696,880 | 726,370 |
| North Dakota | (4) | (4) | (4) | 32,854 | 32,364 |
| Oklahoma | 760,743 | 798,653 | 880,422 | 878,755 | 899,926 |
| Pennsylvania | 2,639 | 2,612 | 2,555 | 3,127 | 2,149 |
| Texas | 4,578,623 | 4,771,916 | 4,997,825 | 5,665,071 | 5,888,150 |
| Utah | (3) | (3) | (3) | (3) | (3) |
| West Virginia [1] | 214,372 | 209,753 | [5] 241,136 | [5] 209,324 | 331,656 |
| Wyoming | 170,159 | 149,776 | 171,981 | 157,345 | 188,697 |
| Total | 9,768,189 | 10,261,669 | 11,089,241 | 12,430,353 | 13,248,091 |

[1] Includes gas from transmission lines, previously treated in other States.
[2] Michigan included in Kentucky.
[3] Utah included in Montana.
[4] North Dakota included in Nebraska.
[5] Florida included in West Virginia.

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## WORLD PRODUCTION

The United States, U.S.S.R., Canada, and Rumania were the leading countries in world marketed production of natural gas (fig. 7, table 15). The 1960–64 growth shown in figure 7 is presented on logarithmic scale. Asia was not included in the comparison because 1964 data were not available. Nigeria and Algeria are the important countries in marketed production of natural gas in Africa.

**TABLE 15.—Marketed production of natural gas by countries [1] at 60° F (15.56° C) and normal atmospheric pressure [2]**

(Million cubic feet)

| Country [1] | 1960 | 1961 | 1962 | 1963 | 1964 [p] |
|---|---|---|---|---|---|
| North America: | | | | | |
| Barbados | 88 | 109 | 120 | 128 | 94 |
| Canada | 522,972 | 655,738 | 946,909 | 1,117,425 | 1,363,814 |
| Mexico [3] | 360,691 | 381,027 | 392,420 | 424,366 | NA |
| Trinidad | 27,042 | 29,375 | 30,018 | 29,693 | 42,114 |
| United States | 12,771,038 | 13,254,025 | 13,876,622 | 14,746,663 | 15,546,592 |
| South America: | | | | | |
| Argentina | 51,607 | 88,673 | 111,852 | [e] 120,400 | [e] 148,500 |
| Brazil [3] | 19,962 | 19,663 | 19,082 | 18,806 | 19,844 |
| Chile [3] | 81,873 | 95,120 | 132,844 | 192,402 | 235,166 |
| Colombia | 15,077 | 15,562 | 22,093 | 26,199 | NA |
| Peru | 29,558 | 33,710 | 35,151 | 37,353 | 45,134 |
| Venezuela | 190,033 | 200,184 | 214,254 | 230,190 | 250,902 |
| Europe: | | | | | |
| Austria | 54,830 | 58,073 | 61,013 | 63,406 | 65,827 |
| Czechoslovakia | 161,633 | 167,977 | 187,533 | 199,961 | NA |
| France | 106,199 | 151,951 | 176,886 | 195,012 | 194,363 |
| Germany, West | 16,709 | 17,960 | 23,007 | 34,148 | 54,368 |
| Hungary [3] | 12,750 | 12,078 | 12,692 | 22,834 | 29,250 |
| Italy | 240,610 | 256,116 | 266,860 | 271,227 | 286,778 |
| Netherlands | 13,435 | 18,212 | 20,713 | [e] 8,066 | [e] 11,731 |
| Poland | 20,205 | 26,956 | 29,531 | 35,275 | 45,930 |
| Rumania | 243,304 | 268,603 | 329,805 | 376,970 | 426,073 |
| U.S.S.R. | 1,754,040 | 2,272,788 | 2,806,464 | 3,414,780 | 4,105,349 |
| United Kingdom | 35 | 106 | 115 | NA | NA |
| Yugoslavia | 1,976 | 2,566 | 3,557 | 7,131 | 10,224 |
| Asia: | | | | | |
| Brunei | 3,043 | 3,005 | 2,990 | 2,377 | NA |
| Burma [3] | 784 | 560 | 672 | 597 | NA |
| India | 5,201 | NA | NA | NA | NA |
| Indonesia [3] | 90,725 | 95,577 | 101,212 | 104,421 | NA |
| Iran | 33,558 | 104,221 | 107,161 | 108,511 | NA |
| Iraq | 22,504 | 23,773 | NA | NA | NA |
| Israel | 1,203 | 106 | 396 | 367 | 1,069 |
| Japan [3] | 27,297 | 35,464 | 45,122 | 63,243 | 69,368 |
| Pakistan | 29,842 | 34,665 | 42,076 | 49,459 | 59,100 |
| Taiwan | 949 | 1,383 | 1,433 | 1,890 | 6,322 |
| Africa: | | | | | |
| Algeria (Sahara) | NA | 8,615 | 13,189 | 14,715 | 30,182 |
| Gabon, Republic of | 278 | 249 | 328 | 321 | 353 |
| Morocco | 352 | 299 | 278 | 372 | 436 |
| Nigeria | [4] 4,949 | [4] 13,802 | [4] 18,159 | NA | 36,333 |
| Tunisia | 252 | 259 | 262 | 272 | 293 |
| Oceania: New Zealand | 5 | 5 | 4 | 3 | 5 |

[p] Preliminary.
[e] Estimate.
NA. Not available.
[1] Natural gas is produced in China, but there is no recent information available.
[2] Table incorporates some revisions.
[3] Total production.
[4] Deliveries for sale.
[5] Year ended March 31 of year following that stated.

NOTE.—Data relate, as far as possible, to natural gas actually collected and utilized as fuel or raw material. They exclude gas used for repressuring, as well as gas flared, vented, or otherwise wasted, whether or not it has first been processed for the extraction of natural gasoline.

For countries reporting in the metric system, the following conversion factor will be used:

$m^3$ at 32° F (0° C) × 37.32 = $ft^3$ at 60° F

($ft^3$ at 60° F × 0.026795 = $m^3$ at 32° F)

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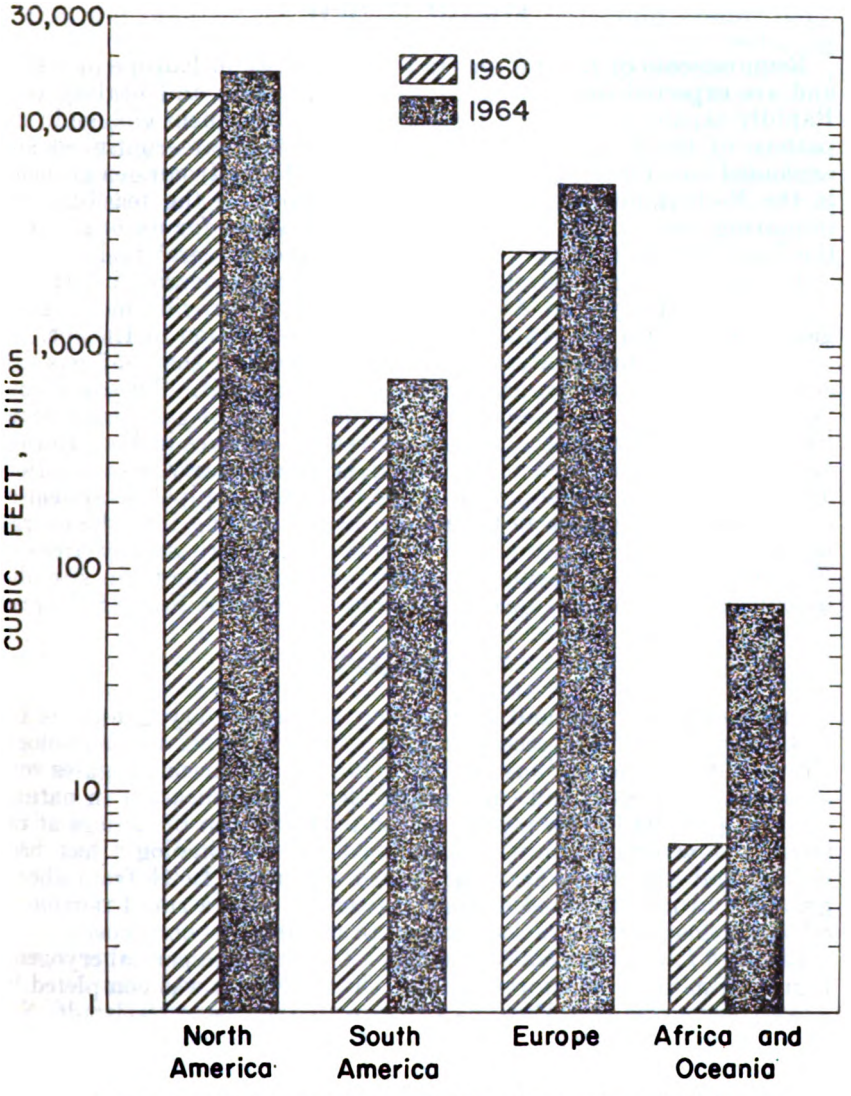


FIGURE 7.—World marketed production of natural gas, 1960–64.

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## WORLD REVIEW

Requirements of natural gas and other energy in Europe increased and are expected to continue to grow at a steady and healthy rate. Rapidly expanding demand for gas and the consequent change in the pattern of the European energy market will ensure continued and expanded use of natural gas. Development of the Groningen gasfields in the Netherlands, the North Sea potential, and the feasibility of importing gas provide the impetus for the future for natural gas in the European market as a supplement to other mineral fuels.

These natural gas developments plus new discoveries in France, Netherlands, Italy, and Austria gradually will provide most of the gas for long-term growth in rate of fuel consumption in Europe.

World interests in natural gas were focused on the 1957 gas discovery in the Groningen gasfield in the Netherlands. This field contains an estimated reserve of 39 trillion cubic feet of gas, nearly three times the energy of all the present proved oil reserves in Free Europe and 40 times the present Netherlands total yearly consumption. Through forceful development of the natural gas pipeline system of the Netherlands, gas from Groningen began moving into the energy markets in 1964. Eventually it will be extended to nearby areas of Europe. These Groningen gas reserves have been the main stimulus in extensive preliminary gas-exploratory work in the North Sea areas.

## TECHNOLOGY

**Cryogenics.**—A new and dominating technique, cryogenics, is the basis for some of the recent industry advancements in technology. Previously, cryogenics was used largely in manufacturing gases such as oxygen, nitrogen, and carbon dioxide. Its application in natural gas was principally for separation and purification of helium at extremely low temperatures. The cryogenics technology has been refined and experience is being gained for using LNG from aboveground and underground storage systems to meet a small portion of offpeak demands in a few locations at promising economic costs.

**Liquefied Natural Gas (LNG) Storage.**—The first commercial cryogenic inground natural gas storage in the United States was completed by Transcontinental Gas Pipeline Co. late in 1964 near Carlstadt, N.J. The $12 million natural gas storage facility is capable of receiving 11.5 million cubic feet per day of gas during the off-season months and of delivering 200 million cubic feet of gas during peak demand periods. The installation is located adjacent to the 30- and 36-inch-interstate-transmission pipeline terminal of the company, in the center of a densely populated area. Accessibility to the main transmission line and large consumption markets give it an added advantage over distant underground storage. The gas will be sold to utility companies for winter peak-shaving purposes at $2.20 per Mcf, about ½ to ¾ the cost of using liquefied petroleum gas (LPG) for peak shaving.

**High Pressure Gas Storage.**—A natural gas distribution company completed an underground gas storage project in New Jersey, in which gas is stored in high-pressure containers made from 42-inch-diameter line pipe. This underground-storage facility, though of small ca-

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pacity, will improve company economics by providing greater flexibility in operations, balancing daily requirements, and reducing pipeline storage service. Sixteen lengths of newly developed 42-inch, type-X-60 line pipe, each 1,080 feet long, will store 10 million cubic feet of gas at 980 psi.

**Cushion Gas in Underground Storage.**—The Bureau of Mines, continuing a 40-year program of cooperative research with the American Gas Association, has completed a feasibility study for using inert-gas cushions in underground natural gas storage. Use of gas storage in permeable underground formations is an increasing trend by the gas industry for augmenting gas-transmission volumes during peak-demand periods.

A fundamental requirement for such operations is an initial quantity (cushion) of compressed gas in storage to furnish the expulsive energy for removing gas (working gas) during withdrawal periods. In gas storage operations, cushion gas represents a large investment; consequently, use of a relatively inexpensive inert gas (nitrogen), if feasible, would be economically desirable.

Results of laboratory and field studies show that the use of an inert-gas cushion would be tedious and expensive, requiring precise monitoring and measurement of reservoir pressure, produced, and injected gas; also, cushion and working gases are subject to mixing.

**LNG Tankers.**—The first commercial cargo of Algerian LNG for Britain arrived in October. The S.S. *Methane Princess* carried the gas in liquid form from the liquefaction plant at Arzew, Algeria, for 1,500 miles to Canvey Island at a temperature of minus 258° F. The S.S. *Methane Progress*, a sister ship, has been placed in service; soon the two ships will make 60 round trips a year, supplying 10 percent of present yearly gas consumption of Britain. Within the next decade tankers are expected to move 330,000 barrels per day of liquefied methane, equivalent to about 2 billion cubic feet of gas daily.

**Plastics Pipe Used in the Gas Industry.**—In 1964, 78 gas companies installed more than 8 million feet of plastics pipe in new distribution systems and in reliner programs. Use of plastics pipe has increased in the last few years at more than 1,500 miles per year, and in 1964 plastic pipe in gas industry installations exceeded 6,000 miles. More than 100 million feet of plastic pipe was in use in rural natural gas distribution systems for domestic use, chiefly for irrigation power. Such distribution systems constructed of piping materials other than plastics would be too costly. The seasonal loads of these systems are high in summer and have aided the gas industry to offset winter-summer peak-load demands.

**Total Energy.**—A recently coined name "total energy" has been given to a system which from a single fuel source provides all the varied energy requirements of a consumer. This system as applied to natural gas is designed to heat, cool, light, and supply power for the facilities of commercial or industrial users. All of the energy is converted on the site by natural gas driven prime movers matched to the needs of the consumer.

Basically, the on-site generation package consists of reciprocating engines or turbines that drive alternators to generate electricity. Hot exhaust gases from the turbines are discharged into boilers to

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provide energy for heating and absorption cooling. Hot water from the engine jackets also is utilized within the heating and cooling system.

It is estimated that total energy systems are operating in approximately 200 commercial, institutional, and industrial installations. If a prime mover of medium capacity has only the function of generating electricity, the cost to produce electricity is usually equal to utility company rates. When waste heat from engines is used for heating and cooling, savings in fuel costs result to the user.

**Automatic Gas Flow Control.**[5]—The increasing operating cost to produce natural gas and liquid hydrocarbons and to deliver them to pipelines has been a major concern of producing companies. One measure being taken to reduce costs is installation of fieldwide automatic-gas-flow control systems. A system in southern Louisiana controls production from 32 gas completions located in an inland water area accessible only by boat. The primary function of the system is to maintain field gas volumes adequate for the total demand of purchaser at all times. It will compensate automatically for wells going off production by increasing the flow rate of the individual producing completions in proportion to their capabilities. The master control point is capable of making changes either in rate of flow for the entire system or parts of it or in output of selective individual wells as may be needed. Field operators in attendance were reduced from a 24-hour-per-day, three-shift, four-man basis to an 8-hour-per-day, one-shift, two-man basis. Other savings and income-generating advantages resulted from the installation that will provide a 3-year payout of the $120,000 investment.

**Improved Gas Well Completions.**[6]—A practical completion technique has been developed and field tested that involves control of the environmental conditions of fluids and pressure inside the well bore while making casing perforations in gas wells. Results show that the desired pressure condition at the time of perforating is a large differential between the formation and the well bore. Gas rather than liquid is the preferable fluid inside the casing. This method reduces plugging of the formation, which may occur when perforating with liquid at a high-hydrostatic pressure in the well bore. By a proper selection of pressure and fluid conditions in the well at the time of perforating, the efficiency of the completion may be improved considerably with an attendant increase in deliverability of gas from the formation to the well.

The high-pressure equipment required to perform these operations has been developed and is available. Tests have been conducted satisfactorily in wells having tubing pressures as high as 6,200 p.s.i. Gas wells have been successfully perforated by this method with as much as 4,000 p.s.i. differential in the well bore. Weights on top of the perforating guns prevent them from being blown uphole.

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[5] Anderson, J. C., and McMillion, L. M. An Automatic Gas Flow Control System Adaptable to Gas Field Production. Pres. in New Orleans, La., AIME prepr. No. 642, October 6–9, 1963, 7 pp.

[6] White, B., T. Walker, and J. Diebold. A Proven Gas Well Completion Technique for Higher Deliverability. AIME, SPE, paper No. 1002, Houston, Texas, 1964, 12 pp.

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# Natural Gas Liquids

By J. D. Lankford [1] and I. F. Avery [2]

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## GENERAL SUMMARY

In the year 1964, production of natural gas liquids reached a record level of 17,744 million gallons, which exceeded 1963 production by 5.4 percent.

The output of all products included in the total was more than the 1963 level. A breakdown of the production in 1964 by products and the percentage increases over the level of the previous year are as follows: natural gasoline and isopentane, 5,287 million gallons, 7.9 percent; liquefied petroleum (LP) gases, 9,759 million gallons, 4.4 percent; ethane, 984 million gallons, 3.5 percent; and other finished products (including finished gasoline, naphtha, jet fuel, kerosene, distillate fuel oil, other miscellaneous products, and condensate) 1,713 million gallons, 4.7 percent.

The total value of the natural gas liquids at plants in 1964 was $826,392,000. This was slightly higher than in 1963. The average value per gallon produced was the same as it was in 1963 (4.7 cents).

Shipments of liquefied gases and ethane for fuel and chemical uses totaled 12,473,258 thousand gallons in 1964, an increase of 8 percent for the year. Natural gas liquids used as blending material in motor fuel (excluding finished gasoline and naphtha) totaled 8,977 million gallons in 1964, compared with 8,375 million in 1963.

## SCOPE OF REPORT

Statistics on natural gas liquids are collected by the Bureau of Mines from reports submitted by natural gasoline plants, cycling plants, and fractionators that handle natural gas liquids. Information on pro-

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duction, stocks, and distribution is obtained from monthly reports. Annual reports provide data on type of plant, production, value of production, and volume of gas processed. Reports submitted to the Bureau include all natural gas liquids except the small volume recovered at pipeline compressor stations and gas dehydration plants. Such recovery is considered to be of little significance in the national and State totals. Plant condensate is included in the caegory of natural gas liquids. Field condensate, however, is reported with crude oil and is excluded from the total for natural gas liquids. Liquid refinery (LR) gases and ethane produced at petroleum refineries are not natural gas liquids, but to obtain complete distribution information on liquefied gases, the sales data shown in this chapter cover the products of natural gasoline plants and petroleum refineries.

Data on shipments of LP gases are collected by the Bureau of Mines from annual reports received from all producers and distributors and from most of the dealers that sell more than 100,000 gallons of LP gases annually. The reported sample of dealer shipments is expanded by Petroleum Administration for Defense (PAD) districts on the basis of the domestic demand in the districts.

Data on shipments of LP gases used as fuels or chemicals include data on ethane and liquefied gas produced at natural gasoline plants and at petroleum refineries; they exclude, however, data on LP gases blended into motor fuel.

Liquefied gases and ethane, whether obtained from natural gas or from processing in refineries, are defined as follows:

**Ethane.**—Includes all ethane, ethylene, and mixtures containing more than 50 percent of either.

**Propane.**—Includes all products covered by Natural Gas Processors Association (NGPA) specifications for commercial propane.

**Butane-propane.**—Includes all products covered by NGPA specifications for commercial butane-propane mixtures.

**Butanes.**—Includes all products covered by NGPA specifications for commercial butane, except those that contain 60 percent or more isobutane.

**Isobutane.**—Includes all products covered by NGPA specifications for commercial butane that contain 60 percent or more isobutane.

**Other mixtures of liquefied petroleum gases.**—Includes mixtures that cannot be classified within the five classifications mentioned, such as mixtures containing less than 50 percent ethane but more than 50 percent propane and butane.

## DISTRICTS

The Bureau reports the production of natural gas liquids by States. Louisiana and Texas are also reported by districts.

Louisiana is divided into an Inland district and a Gulf Coast district. The Gulf Coast district includes Vernon, Rapides, Avoyelles, Pointe Coupee, West Feliciana, East Feliciana, Tangipahoa, St. Helena, and Washington Parishes (counties) and all parishes in the State south of these. All parishes not included in the Gulf Coast district are in the Inland district.

The Bureau of Mines producing districts in Texas correspond, with one exception, to groupings of the Texas Railroad Commission districts:

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| Bureau of Mines district: | *Railroad Commission district* |
|---|---|
| Gulf Coast | Nos. 2 and 3 |
| West Texas | Nos. 7C and 8 |
| East Proper | Part of No. 6 (east Texas field in Cherokee, Smith, Upshur, Rush, and Gregg Counties) |
| Panhandle | No. 10 |
| Rest of State: | |
| North | Nos. 7B and 9 |
| Central | No. 1 |
| South | No. 4 |
| Other East Texas | Nos. 5 and 6 (exclusive of East proper) |

Refineries are also grouped by the Bureau of Mines into a set of refining districts. These refining districts may be combined to correspond with the grouping originated during World War II by the Petroleum Administration for War, called PAW districts (later changed to PAD districts).

| PAD district: | *Refining district* |
|---|---|
| 1 | *East Coast*—District of Columbia, Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, the following counties of New York: Cayuga, Tompkins, Chemung, and all counties east and north thereof, and the following counties of Pennsylvania: Bradford, Sullivan, Columbia, Montour, Northumberland, Dauphin, York, and all counties east thereof. |
| 1 | *Appalachian No. 1*—West Virginia and those parts of Pennsylvania and New York not included in the East Coast district. |
| 2 | *Appalachian No. 2*—The following counties of Ohio; Erie, Huron, Crawford, Marion, Delaware, Franklin, Pickaway, Ross, Pike, Scioto, and all counties east thereof. |
| 2 | *Indiana-Illinois-Kentucky*—Indiana, Illinois, Kentucky, Tennessee, Michigan, and that part of Ohio not included in the Appalachian district. |
| 2 | *Oklahoma-Kansas-Missouri*—Oklahoma, Kansas, Missouri, Nebraska, and Iowa. |
| 2 | *Minnesota-Wisconsin-North Dakota-South Dakota*—Minnesota, Wisconsin, North Dakota, and South Dakota. |
| 3 | *Texas Inland*—Texas, except Texas Gulf Coast district. |
| 3 | *Texas Gulf Coast*—The following counties of Texas: Newton, Orange, Jefferson, Jasper, Tyler, Hardin, Liberty, Chambers, Polk, San Jacinto, Montgomery, Harris, Galveston, Waller, Fort Bend, Brazoria, Wharton, Matagorda, Jackson, Victoria, Calhoun, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron. |
| 3 | *Louisiana Gulf Coast*—The following parishes of Louisiana: Vernon, Rapides, Avoyelles, Pointe Coupee, West Feliciana, East Feliciana, Tangipahoa, St. Helena, Washington, and all parishes south thereof; the following counties of Mississippi; Pearl River, Stone, George Hancock, Harrison, and Jackson; and Mobile and Baldwin Counties, Alabama. |
| 3 | *North Louisiana-Arkansas*—Arkansas and those parts of Louisiana, Mississippi, and Alabama not included in the Louisiana Gulf Coast district. |
| 3 | *New Mexico*—New Mexico. |
| 4 | *Rocky Mountain*—Montana, Idaho, Wyoming, Utah, and Colorado. |
| 5 | *West Coast*—Washington, Oregon, California, Nevada, Alaska, Arizona, and Hawaii. |

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Some data in this chapter are based on the Bureau of Mines refining districts, while others refer to the PAD districts. Maps showing the PAD and Bureau of Mines refining districts appear in figure 2 of the "Petroleum" chapter of the Minerals Yearbook.

**TABLE 1.—Salient statistics of the natural gas processing industry in the United States, 1960–64**

(Thousands of gallons unless otherwise stated)

| | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Production: | | | | | |
| Natural gasoline and isopentane | 4,479,454 | 4,666,319 | 4,772,260 | 4,899,323 | 5,286,703 |
| LP gases and ethane | 8,444,074 | 9,085,465 | 9,409,083 | 10,302,250 | 10,743,591 |
| Finished gasoline and naphtha | 503,659 | 473,496 | 450,991 | 499,901 | 506,505 |
| Other finished products and condensate | 859,394 | 965,648 | 1,021,271 | 1,135,743 | 1,206,973 |
| Total | 14,286,581 | 15,190,928 | 15,653,605 | 16,837,217 | 17,743,772 |
| Shipments for use in gasoline: [1] | 7,019,971 | 7,493,891 | 7,788,552 | 8,375,447 | 8,976,736 |
| Finished gasoline and naphtha | 502,401 | 479,271 | 447,312 | 499,155 | 511,034 |
| Transfer to nongasoline uses (fuel and chemical): | | | | | |
| LP gases and ethane [2] | 6,391,217 | 6,693,573 | 7,506,776 | 7,645,055 | 7,963,990 |
| Other finished products | 212,483 | 197,823 | 171,165 | 211,558 | 230,537 |
| Stocks at plants, terminals, and refineries: | | | | | |
| Natural gasoline | 197,559 | 198,608 | 174,835 | 168,228 | 183,023 |
| LP gases and ethane | 946,758 | 1,294,090 | 1,057,295 | 1,166,056 | 1,243,713 |
| Other finished products | 70,507 | 64,120 | 86,034 | 83,078 | 71,757 |
| Total | 1,214,824 | 1,556,818 | 1,318,164 | 1,417,362 | 1,498,493 |
| Value of natural gas liquids at plants thousand dollars | 808,385 | 782,205 | 798,151 | 798,943 | 826,392 |
| Average value per gallon cents | 5.7 | 5.1 | 5.1 | 4.7 | 4.7 |
| Natural gas processed, million cubic feet | 9,768,189 | 10,261,669 | 11,089,241 | 12,430,353 | 13,248,091 |
| Average yield, all natural gas liquids gallons per thousand cubic feet | 1.46 | 1.48 | 1.41 | 1.35 | 1.34 |
| Shipments for fuel and chemical uses: | | | | | |
| Liquefied petroleum gas and ethane (LP gases) | 6,332,699 | 6,482,109 | 7,502,702 | 7,565,284 | 7,999,754 |
| Liquefied refinery gas and ethane (LR gases) | 3,211,950 | 3,315,774 | 3,226,692 | 4,004,994 | 4,473,504 |
| Total | 9,544,649 | 9,797,883 | 10,729,394 | 11,570,278 | 12,473,258 |
| Exports of natural gasoline, LP gases, and LR gases | 125,590 | 149,044 | 162,968 | r193,073 | 225,346 |
| mports of LP gases and LR gases | 68,502 | 75,852 | 94,416 | 104,790 | 196,879 |

r Revised.
[1] Includes exports of natural gasoline, and changed to show "finished gasoline and naphtha" separately.
[2] Includes exports of LP gases.

## RESERVES

The American Gas Association Reserves Committee has estimated the total proved reserves of natural gas liquids in the United States, as of December 31, 1964, to be 7,747 million barrels, an increase of 73 million barrels for the year. Texas accounted for 51 percent of the total natural gas-liquids reserves (a decrease of 2 percent from that of 1963). Texas reserves decreased 83 million barrels, and Louisiana reserves, with 25 percent of the total, increased 101 million barrels. Reserves decreased in 8 of the 21 States reported.

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**TABLE 2.—Estimated proved recoverable reserves of natural gas liquids[1] in the United States**

(Thousand barrels)

| State | Reserves as of Dec. 31, 1963 | Changes in reserves during 1964 | | | Reserves as of December 31, 1964 | | | |
|---|---|---|---|---|---|---|---|---|
| | | Extensions and revisions | Discoveries of new fields and new pools | Net production | Nonassociated with oil | Associated with oil | Dissolved in oil | Total |
| Arkansas | 18,695 | 1,871 | 41 | 1,597 | 2,025 | 8,631 | 8,354 | 19,010 |
| California[2] | 290,070 | 6,624 | 1,610 | 25,340 | 9,745 | 80,513 | 182,706 | 272,964 |
| Colorado | 21,990 | 5,812 | 1,189 | 3,263 | 3,750 | 2,710 | 19,268 | 25,728 |
| Illinois | 3,744 | −6 | 7 | 574 | 0 | 0 | 3,171 | 3,171 |
| Indiana | 95 | 13 | 0 | 17 | 3 | 3 | 85 | 91 |
| Kansas | 169,241 | 49,981 | 676 | 9,912 | 199,990 | 7,561 | 2,435 | 209,986 |
| Kentucky | 51,005 | 3,936 | 1,968 | 3,451 | [3] 53,458 | 0 | 0 | 53,458 |
| Louisiana[2] | 1,840,823 | 170,782 | 59,878 | 129,983 | 1,681,799 | 197,543 | 62,158 | 1,941,500 |
| Michigan | 5,326 | 1,635 | 285 | 1,385 | 969 | 2,931 | 1,961 | 5,861 |
| Mississippi | 33,148 | 2,363 | 104 | 2,740 | 24,969 | 1,946 | 5,960 | 32,875 |
| Montana | 9,978 | 3,584 | 0 | 590 | 2,304 | 0 | 10,668 | 12,972 |
| Nebraska | 2,775 | 755 | 0 | 419 | 2,024 | 241 | 846 | 3,111 |
| New Mexico | 558,233 | 53,078 | 618 | 35,333 | 398,048 | 44,570 | 133,978 | 576,596 |
| North Dakota | 82,017 | −12,517 | 0 | 2,360 | 0 | 19,313 | 47,827 | 67,140 |
| Ohio | 0 | 0 | 1,200 | 66 | 0 | 0 | 1,134 | 1,134 |
| Oklahoma | 328,193 | 40,531 | 3,225 | 29,047 | 204,285 | 44,900 | 93,717 | 342,902 |
| Pennsylvania | 1,437 | 0 | 0 | 59 | [3] 1,378 | 0 | 0 | 1,378 |
| Texas[2] | 4,042,358 | 117,602 | 73,318 | 273,490 | 2,089,045 | 633,807 | 1,236,936 | 3,959,788 |
| Utah | 46,591 | 7,970 | 2,137 | 2,041 | 613 | 20,000 | 34,044 | 54,657 |
| West Virginia | 68,779 | 5,617 | 2,808 | 7,430 | 69,774 | 0 | 0 | 69,774 |
| Wyoming | 99,480 | −1,929 | 1,978 | 6,993 | 47,654 | 379 | 44,503 | 92,536 |
| Total | 7,673,978 | 457,702 | 151,042 | 536,090 | 4,791,833 | 1,065,048 | 1,889,751 | 7,746,632 |

[1] Comprises natural gasoline, LP gases, and condensate.
[2] Includes offshore reserves.
[3] Not allocated by types but occurring principally in column shown.

Source: Committee on Natural Gas Reserves, American Gas Association.

## PRODUCTION

Since 1958, new production levels have been attained each year. For 1964 production was 17,744 million gallons, exceeding the previous high by 907 million gallons. Production of LP gases and ethane increased 441 million gallons. Propane, which represented 51 percent of all LP gases produced in 1964, totaled 5,446 million gallons, which was 274 million gallons more than the 1963 total. Ethane production also showed an increase for the year, up 34 million gallons. Production of natural gasoline and cycle products increased to 7 billion gallons, a gain of 465 million gallons for the year.

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**TABLE 3.—Natural gas liquids and ethane produced, value at plants in the United States in 1964, by State**

| State | Number of operators [2] | Natural gasoline [1] | | | LP gases and ethane | | | Condensate | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Thousand gallons | Thousand dollars | Cents per gallon | Thousand gallons | Thousand dollars | Cents per gallon | Thousand gallons | Thousand dollars | Cents per gallon |
| Arkansas | 5 | 27,068 | 1,521 | 5.6 | 61,616 | 2,460 | 4.0 | | | |
| California | 19 | 687,838 | 51,531 | 7.5 | 352,614 | 15,893 | 4.5 | 32,535 | 2,557 | 7.9 |
| Colorado | 6 | 52,400 | 2,845 | 5.4 | 88,916 | 3,894 | 4.4 | | | |
| Illinois | 3 | 14,109 | 1,030 | 7.3 | 312,173 | 13,758 | 4.4 | | | |
| Kansas | 12 | 159,635 | 8,577 | 5.4 | 512,747 | 18,121 | 3.5 | 2,649 | 106 | 4.0 |
| Kentucky [3] | 3 | 23,348 | 1,645 | 7.0 | 268,078 | 12,080 | 4.5 | 273 | 14 | 5.1 |
| Louisiana | 39 | 538,959 | 33,248 | 6.2 | 1,247,484 | 45,935 | 3.7 | 370,579 | 25,713 | 6.9 |
| Mississippi | 5 | 24,862 | 1,474 | 5.9 | 23,277 | 780 | 3.4 | 2,301 | 147 | 6.4 |
| Montana [4] | 5 | 28,386 | 1,565 | 5.9 | 73,456 | 2,316 | 3.2 | | | |
| Nebraska | 4 | 9,587 | 627 | 6.5 | 24,556 | 1,092 | 4.4 | | | |
| New Mexico | 14 | 346,068 | 21,033 | 6.1 | 739,190 | 21,641 | 2.9 | 845 | 47 | 5.6 |
| North Dakota | 3 | 21,368 | 1,338 | 6.3 | 84,338 | 2,960 | 3.5 | | | |
| Oklahoma | 36 | 473,405 | 28,504 | 6.0 | 880,804 | 28,055 | 3.2 | 76,780 | 5,257 | 6.8 |
| Pennsylvania | 4 | 1,138 | 64 | 5.6 | 1,481 | 100 | 6.8 | | | |
| Texas | 83 | 2,748,764 | 178,273 | 6.5 | 5,521,236 | 167,492 | 3.0 | 492,446 | 35,978 | 7.3 |
| West Virginia [5] | 9 | 45,158 | 2,924 | 6.5 | 398,643 | 19,782 | 5.0 | 1,406 | 61 | 4.3 |
| Wyoming | 12 | 84,610 | 5,515 | 6.5 | 152,982 | 6,433 | 4.2 | 1,374 | 86 | 6.3 |
| Total | 164 | 5,286,703 | 341,714 | 6.5 | 10,743,591 | 362,792 | 3.4 | 981,188 | 69,966 | 7.1 |

| | Finished gasoline and naphtha | | | Other products [6] | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Thousand gallons | Thousand dollars | Cents per gallon | Thousand gallons | Thousand dollars | Cents per gallon | Thousand gallons | Thousand dollars | Cents per gallon |
| Arkansas | | | | 3,014 | 157 | 5.2 | 91,698 | 4,138 | 4.5 |
| California | | | | | | | 1,072,987 | 69,981 | 6.5 |
| Colorado | | | | | | | 141,316 | 6,739 | 4.8 |
| Illinois | | | | | | | 326,282 | 14,788 | 4.5 |
| Kansas | | | | 441 | 30 | 6.8 | 675,472 | 26,834 | 4.0 |
| Kentucky [3] | | | | | | | 291,699 | 13,739 | 4.7 |
| Louisiana | 278,614 | 23,026 | 8.3 | 164,828 | 9,944 | 6.0 | 2,600,464 | 137,866 | 5.3 |
| Mississippi | | | | 322 | 23 | 7.1 | 50,762 | 2,424 | 4.8 |
| Montana [4] | | | | | | | 101,842 | 3,881 | 3.9 |
| Nebraska | | | | | | | 34,143 | 1,719 | 5.0 |
| New Mexico | | | | 9,134 | 490 | 5.4 | 1,095,237 | 43,211 | 3.9 |
| North Dakota | | | | | | | 105,706 | 4,298 | 4.1 |
| Oklahoma | 2,488 | 163 | 6.6 | 1,380 | 87 | 6.3 | 1,434,857 | 62,066 | 4.3 |
| Pennsylvania | | | | | | | 2,619 | 164 | 6.3 |
| Texas | 225,403 | 14,626 | 6.5 | 45,847 | 3,368 | 7.3 | 9,033,696 | 399,737 | 4.4 |
| West Virginia [5] | | | | | | | 445,207 | 22,767 | 5.1 |
| Wyoming | | | | 819 | 6 | 7.3 | 239,785 | 12,040 | 5.0 |
| Total | 506,505 | 37,815 | 7.5 | 225,785 | 14,105 | 6.2 | 17,743,772 | 826,392 | 4.7 |

[1] Includes isopentane.
[2] A producer operating in more than 1 State is counted but once in arriving at total United States.
[3] Michigan (4 operators) included with Kentucky.
[4] Utah (2 operators) included with Montana.
[5] Florida (1 operator) included with West Virginia.
[6] Includes kerosine, jet fuel, distillate fuel, etc.

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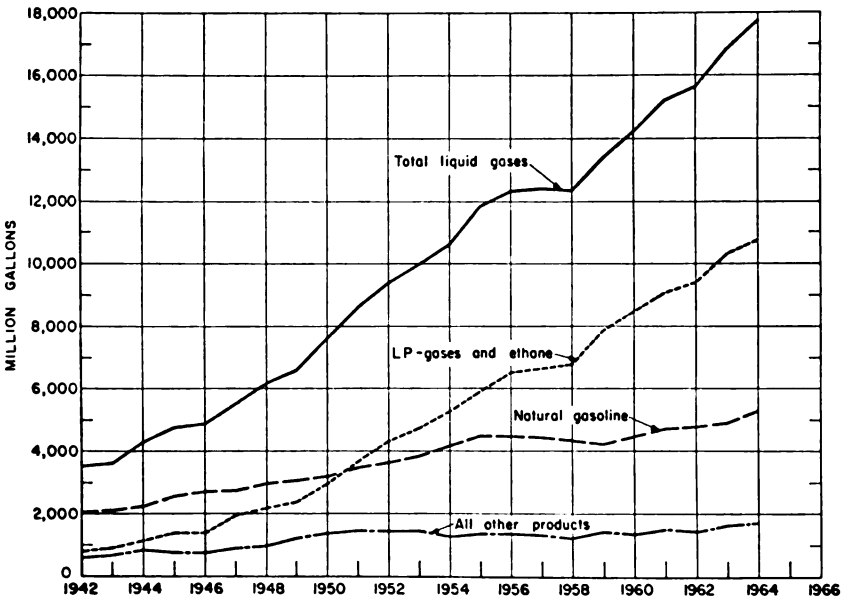


FIGURE 1.—Production of natural gas liquids in the United States, 1942–64.

## NATURAL GAS PROCESSED, YIELD, AND DISPOSITION OF RESIDUE GAS

The average yield of natural gas liquids per thousand cubic feet of natural gas processed was 1.34 gallons in 1964, compared with 1.35 gallons in 1963. The total volume of natural gas processed was 13,248 billion cubic feet.

Table 5 shows the disposition of residue gas and the volume of gas loss (shrinkage) brought about by the extraction of the natural gas liquids. Before 1962 the extraction loss per gallon of liquids produced was considered to approximate 34 cubic feet. Better reporting of the ethane component necessitated revising the previous extraction loss factor. According to data compiled for 1962 and 1963, the extraction loss averaged 40 cubic feet per gallon, and for 1964, 41 cubic feet per gallon.

Residue gas is defined as that gas which remains after the natural gas liquids have been extracted at processing plants. In 1964 this totaled 12,525,526 million cubic feet, of which 84 percent was marketed, 12 percent was returned to the well for repressuring, and 4 percent was used as fuel at the processing plant.

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**TABLE 4.—Monthly production of natural gas liquids and ethane in the United States in 1964, by States and districts[1]**

(Thousand gallons)

| States by pertoleum districts | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| District 1: | | | | | | | | | | | | | |
| Western Pennsylvania | 258 | 247 | 302 | 206 | 167 | 108 | 245 | 210 | 210 | 219 | 222 | 225 | 2,619 |
| West Virginia and Florida | 42,031 | 37,761 | 39,785 | 37,155 | 32,338 | 34,568 | 35,634 | 35,469 | 35,443 | 37,181 | 36,941 | 40,901 | 445,207 |
| Total | 42,289 | 38,008 | 40,087 | 37,361 | 32,505 | 34,676 | 35,879 | 35,679 | 35,653 | 37,400 | 37,163 | 41,126 | 447,826 |
| District 2: | | | | | | | | | | | | | |
| Illinois | 31,151 | 28,762 | 28,284 | 22,699 | 25,144 | 24,340 | 26,582 | 28,100 | 27,397 | 25,107 | 28,995 | 29,721 | 326,282 |
| Kentucky and Michigan | 25,685 | 27,209 | 23,506 | 23,055 | 23,353 | 17,961 | 19,837 | 25,570 | 24,926 | 26,851 | 26,579 | 27,167 | 291,699 |
| Kansas | 63,411 | 57,174 | 57,915 | 57,934 | 53,693 | 41,005 | 48,921 | 54,234 | 58,326 | 53,210 | 57,210 | 72,439 | 675,472 |
| Nebraska | 3,528 | 3,352 | 3,574 | 3,189 | 2,927 | 2,481 | 2,258 | 2,761 | 2,683 | 2,543 | 2,213 | 2,634 | 34,143 |
| North Dakota | 9,302 | 7,333 | 8,131 | 7,965 | 6,763 | 7,992 | 9,635 | 9,208 | 9,501 | 10,043 | 10,210 | 9,623 | 105,706 |
| Oklahoma | 126,888 | 120,820 | 128,148 | 119,721 | 116,059 | 114,715 | 107,408 | 114,620 | 110,596 | 122,836 | 122,619 | 130,427 | 1,434,857 |
| Total | 259,965 | 244,650 | 249,558 | 234,563 | 227,939 | 208,494 | 214,641 | 234,493 | 233,429 | 240,590 | 247,826 | 272,011 | 2,868,159 |

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| District 3: | | | | | | | | | | | | | |
| Arkansas | 8,049 | 6,987 | 7,558 | 7,377 | 7,961 | 7,705 | 7,625 | 7,845 | 7,130 | 7,871 | 7,558 | 8,032 | 91,608 |
| Louisiana: | | | | | | | | | | | | | |
| Gulf | 151,123 | 145,494 | 151,718 | 138,232 | 137,674 | 141,396 | 154,632 | 151,874 | 168,005 | 151,985 | 162,385 | 169,162 | 1,823,680 |
| Inland | 67,470 | 66,166 | 68,071 | 65,482 | 61,101 | 58,483 | 61,666 | 64,017 | 62,418 | 65,232 | 66,697 | 69,981 | 776,784 |
| Total Louisiana | 218,593 | 211,660 | 219,789 | 203,714 | 198,775 | 199,879 | 216,298 | 215,891 | 230,423 | 217,217 | 229,082 | 239,143 | 2,600,464 |
| Mississippi and Alabama | 4,051 | 3,928 | 4,175 | 4,186 | 4,493 | 4,314 | 4,349 | 4,461 | 4,202 | 4,353 | 4,165 | 4,085 | 50,762 |
| New Mexico | 89,042 | 83,127 | 93,638 | 92,813 | 93,694 | 91,349 | 95,537 | 94,312 | 86,938 | 91,341 | 89,663 | 93,783 | 1,095,237 |
| Texas: | | | | | | | | | | | | | |
| Gulf | 174,051 | 165,008 | 177,773 | 166,915 | 163,587 | 160,336 | 171,736 | 167,014 | 168,349 | 173,143 | 166,288 | 175,825 | 2,030,025 |
| West | 230,149 | 213,503 | 234,688 | 216,941 | 255,526 | 238,857 | 251,059 | 250,051 | 241,479 | 255,843 | 237,344 | 246,627 | 2,872,067 |
| East (field) | 16,256 | 15,492 | 16,944 | 16,964 | 17,508 | 17,650 | 18,216 | 17,943 | 17,621 | 17,656 | 16,706 | 17,902 | 206,858 |
| Panhandle | 124,224 | 116,785 | 120,598 | 119,736 | 117,090 | 109,647 | 114,655 | 114,206 | 116,185 | 122,061 | 117,930 | 123,766 | 1,416,883 |
| Rest of State (other) | 228,817 | 209,375 | 217,025 | 203,968 | 201,467 | 194,446 | 204,436 | 208,566 | 202,712 | 211,530 | 217,988 | 207,533 | 2,507,863 |
| Total Texas | 773,497 | 720,163 | 767,028 | 724,524 | 755,178 | 720,936 | 760,102 | 757,780 | 746,346 | 780,233 | 756,256 | 771,653 | 9,033,696 |
| Total | 1,093,232 | 1,025,865 | 1,092,188 | 1,032,614 | 1,060,101 | 1,024,183 | 1,083,911 | 1,080,289 | 1,075,030 | 1,101,015 | 1,086,724 | 1,116,696 | 12,871,857 |
| District 4: | | | | | | | | | | | | | |
| Colorado | 12,927 | 12,560 | 13,768 | 10,489 | 10,831 | 10,230 | 10,388 | 10,631 | 10,382 | 13,132 | 12,786 | 13,192 | 141,316 |
| Montana and Utah | 8,330 | 8,033 | 8,780 | 9,145 | 10,039 | 8,790 | 9,191 | 7,876 | 8,167 | 8,113 | 7,113 | 8,265 | 101,842 |
| Wyoming | 21,225 | 19,270 | 21,408 | 21,917 | 20,603 | 19,116 | 18,804 | 18,223 | 19,115 | 18,882 | 20,135 | 21,087 | 239,785 |
| Total | 42,482 | 39,863 | 43,956 | 41,551 | 41,473 | 38,136 | 38,383 | 36,730 | 37,664 | 40,127 | 40,034 | 42,544 | 482,943 |
| District 5 | 99,063 | 91,269 | 95,844 | 89,182 | 90,221 | 84,099 | 86,141 | 85,607 | 83,426 | 87,291 | 87,962 | 92,882 | 1,072,987 |
| Grand total | 1,537,031 | 1,439,655 | 1,521,633 | 1,435,271 | 1,452,239 | 1,389,588 | 1,458,955 | 1,472,798 | 1,465,211 | 1,506,423 | 1,499,709 | 1,565,259 | 17,743,772 |

[1] West Pennsylvania separated from eastern part of State to allow grouping in either Bureau of Mines refinery district or Petroleum Administration for Defense district. Districts shown for Texas and Louisiana are Bureau of Mines production districts. (These districts are described under the heading "Districts.")

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**TABLE 5.—Production at natural gas processing plants and disposition of residue gas in the United States in 1963–64, by States**

(Millions of cubic feet unless otherwise stated)

| State | Total natural gas liquids and ethane production (thousand gallons) | Natural gas processed | Extraction loss (shrinkage) | Disposition of residue gas | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Used at plants | Returned to formation | Vented or flared | Pipeline | | Total residue gas |
| | | | | | | | Returned to producer | To other companies | |
| 1963: | | | | | | | | | |
| Arkansas | 92,596 | 132,535 | 4,705 | 3,430 | 19,191 | 30 | 639 | 104,540 | 127,830 |
| California | 1,108,806 | 549,077 | 38,393 | 33,830 | 191,007 | 386 | 86,367 | 199,094 | 510,684 |
| Colorado | 148,178 | 121,043 | 6,447 | 4,954 | 31,005 | 21 | 7,705 | 70,911 | 114,596 |
| Illinois | 352,217 | [1] 199,877 | 13,674 | 1,845 | ---------- | ---------- | 184,180 | 178 | 186,203 |
| Kansas | 561,247 | 687,331 | 11,378 | 6,957 | ---------- | 86 | 392,854 | 276,056 | 675,953 |
| Kentucky [2] | 274,928 | [1] 298,450 | 14,404 | 3,185 | ---------- | 259 | 234,044 | 46,558 | 284,046 |
| Louisiana | 2,257,377 | 2,646,572 | 62,053 | 50,876 | 198,358 | 1,736 | 280,047 | 2,053,502 | 2,584,519 |
| Mississippi | 53,298 | 90,459 | 1,787 | 2,587 | 25,357 | 93 | 8,798 | 51,837 | 88,672 |
| Montana [3] | 110,243 | 50,986 | 3,923 | 4,116 | 13,216 | 141 | 2,911 | 26,679 | 47,063 |
| Nebraska | 36,050 | 10,667 | 1,436 | 1,793 | 256 | ---------- | 812 | 6,370 | 9,231 |
| New Mexico | 1,019,588 | 696,880 | 43,868 | 28,870 | 19,496 | 2,528 | 93,848 | 508,270 | 653,012 |
| North Dakota | 100,164 | 32,854 | 4,793 | 4,269 | ---------- | 1,022 | 3,629 | 19,141 | 28,061 |
| Oklahoma | 1,366,361 | 878,755 | 52,578 | 47,486 | 85,105 | 3,771 | 90,966 | 598,849 | 826,177 |
| Pennsylvania | 3,032 | 3,127 | 102 | 31 | 45 | ---------- | 2,949 | ---------- | 3,025 |
| Texas | 8,687,247 | 5,665,071 | 385,054 | 262,051 | 908,890 | 27,682 | 812,670 | 3,268,724 | 5,280,017 |
| West Virginia [4] | 429,434 | [1] 209,324 | 16,980 | 10,113 | ---------- | ---------- | 130,077 | 52,154 | 192,344 |
| Wyoming | 236,451 | 157,345 | 8,676 | 7,199 | 14,183 | 211 | 4,826 | 122,250 | 148,669 |
| Total | 16,837,217 | 12,430,353 | 670,251 | 473,592 | 1,506,109 | 37,966 | 2,337,322 | 7,405,113 | 11,760,102 |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1964: | | | | | | | | | |
| Arkansas | 91,698 | 127,862 | 4,091 | 3,606 | 20,413 | 40 | 327 | 99,385 | 123,771 |
| California | 1,068,518 | 532,250 | 36,070 | 33,100 | 183,196 | 296 | 80,670 | 196,018 | 495,280 |
| Colorado | 141,316 | 117,910 | 5,556 | 4,062 | 27,637 | 244 | 10,733 | 69,678 | 112,354 |
| Illinois | 326,282 | [1] 196,907 | 14,400 | 998 | 124 | 201 | 180,774 | 410 | 182,507 |
| Kansas | 675,472 | 804,129 | 21,475 | 6,918 | | 147 | 249,693 | 825,896 | 782,634 |
| Kentucky [2] | 291,699 | [1] 408,859 | 15,686 | 2,265 | | 275 | 14,537 | 370,096 | 393,173 |
| Louisiana | 2,600,464 | 2,844,739 | 64,825 | 44,466 | 180,580 | 259 | 158,709 | 2,395,900 | 2,779,914 |
| Mississippi | 50,762 | 82,775 | 1,836 | 2,183 | 23,340 | 36 | 9,678 | 45,702 | 80,989 |
| Montana [4] | 101,842 | 52,955 | 3,819 | 4,075 | 16,460 | 173 | 3,076 | 25,852 | 49,136 |
| Nebraska | 34,143 | 10,381 | 1,777 | 552 | 11 | | 4,299 | 3,754 | 8,616 |
| New Mexico | 1,065,237 | 726,370 | 46,101 | 37,545 | 12,490 | 4,050 | 107,800 | 616,384 | 678,269 |
| North Dakota | 105,706 | 32,364 | 5,407 | 4,313 | | 355 | 4,440 | 17,849 | 26,937 |
| Oklahoma | 1,435,427 | 899,926 | 53,171 | 44,153 | 61,043 | 1,312 | 81,754 | 658,493 | 846,755 |
| Pennsylvania | 2,619 | 2,149 | 115 | 13 | 60 | | 805 | 1,166 | 2,034 |
| Texas | 9,033,696 | 5,898,150 | 419,320 | 258,901 | 875,938 | 18,285 | 788,380 | 3,527,326 | 5,468,830 |
| West Virginia [4] | 445,207 | [1] 311,656 | 17,115 | 6,101 | 126,915 | | | 182,525 | 314,541 |
| Wyoming | 239,785 | 188,697 | 8,901 | 6,963 | 21,143 | 20 | 4,773 | 146,877 | 179,796 |
| Total | 17,739,871 | 13,248,091 | 722,565 | 459,234 | 1,549,340 | 25,693 | 1,700,448 | 8,790,811 | 12,525,526 |

[1] Includes gas from transmission lines previously treated in another State.
[2] Michigan included with Kentucky.
[3] Utah included with Montana.
[4] Florida included with West Virginia.

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## DEMAND FOR NATURAL GAS LIQUIDS AT PROCESSING PLANTS AND TERMINALS

Total demand for natural gas liquids at plants and terminals in 1964 was 17,682 million gallons, compared with 16,731 million gallons in 1963. Of this total, 51 percent was shipped to refineries for use as blending fuel.

**Motor Fuel Use.**—Shipments of natural gas liquids for use as blending material for motor fuel were 8,977 million gallons in 1964, compared with 8,875 million gallons in 1963.

**Other Uses.**—Shipment of ethane used in the production of chemicals increased 3.4 percent. LP gases shipped for use in the manufacture of chemicals and for fuel use other than motor fuels totaled 6,980 million gallons, compared with 6,693 million gallons in 1963. Other finished products shipped from natural gas processing plants were jet fuel, 17.4 million gallons; kerosine, 62.7 million gallons; distillate fuel, 16.4 million gallons; and miscellaneous finished products, 134.0 million gallons, for a total of 230.5 million gallons. Detailed use of liquefied gases is shown later in this chapter under the heading "Shipments of Liquefied Gases and Ethane."

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**TABLE 6.—Supply and distribution at plants and terminals of natural gas liquids and ethane in the United States in 1964, by months**

(Thousand gallons)

| | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Production: | | | | | | | | | | | | | |
| Natural gasoline | 408,982 | 385,188 | 426,253 | 418,249 | 437,892 | 425,221 | 468,461 | 470,574 | 455,454 | 436,550 | 425,520 | 433,614 | 5,191,958 |
| Ethane | 87,616 | 85,204 | 85,257 | 75,529 | 76,214 | 76,100 | 77,411 | 82,538 | 80,952 | 81,364 | 85,877 | 90,225 | 984,287 |
| LP gases: | | | | | | | | | | | | | |
| Propane | 497,659 | 457,266 | 471,799 | 447,454 | 440,671 | 406,805 | 417,729 | 422,679 | 439,684 | 472,421 | 472,531 | 499,697 | 5,446,395 |
| Butane, normal | 222,894 | 207,399 | 216,238 | 201,363 | 196,637 | 196,331 | 194,778 | 186,798 | 196,306 | 210,021 | 210,278 | 217,667 | 2,456,710 |
| Isobutane | 79,216 | 78,138 | 85,223 | 78,444 | 80,592 | 74,515 | 82,410 | 74,452 | 79,566 | 81,262 | 79,296 | 84,532 | 957,646 |
| Butane-propane mixture | 43,012 | 37,992 | 42,680 | 39,278 | 40,993 | 36,854 | 38,034 | 39,106 | 33,552 | 37,355 | 36,114 | 35,418 | 460,388 |
| Other LP gas mixtures | 30,186 | 31,672 | 34,368 | 34,556 | 36,840 | 36,387 | 37,758 | 50,452 | 36,201 | 37,164 | 35,300 | 37,281 | 438,165 |
| Isopentane | 9,226 | 7,877 | 8,581 | 2,493 | 8,585 | 8,236 | 8,434 | 8,240 | 8,228 | 8,409 | 8,134 | 8,302 | 94,745 |
| Finished gasoline and naphtha | 47,857 | 44,654 | 46,404 | 43,858 | 38,808 | 38,485 | 39,652 | 40,133 | 39,711 | 41,476 | 42,192 | 43,275 | 506,505 |
| Condensate, raw | 89,665 | 83,212 | 83,556 | 74,613 | 74,347 | 73,580 | 76,294 | 78,978 | 79,393 | 83,004 | 87,848 | 96,698 | 981,188 |
| Other finished products | 20,718 | 21,053 | 21,274 | 19,434 | 20,660 | 17,074 | 17,994 | 18,848 | 16,164 | 17,397 | 16,619 | 18,550 | 225,785 |
| Total | 1,537,031 | 1,439,655 | 1,521,633 | 1,435,271 | 1,452,239 | 1,389,588 | 1,458,955 | 1,472,798 | 1,465,211 | 1,506,423 | 1,499,709 | 1,565,259 | 17,743,772 |
| Stock change at plants and terminals | −226,259 | −41,882 | 103,503 | 169,487 | 203,233 | 159,125 | 100,153 | 64,236 | 22,733 | −41,300 | −124,128 | −327,426 | 61,475 |
| Shipments: | | | | | | | | | | | | | |
| For use in gasoline: | | | | | | | | | | | | | |
| Natural gasoline | 406,586 | 382,310 | 416,734 | 412,857 | 435,521 | 433,023 | 472,816 | 474,940 | 457,210 | 438,326 | 431,268 | 431,892 | 5,193,483 |
| LP gases: | | | | | | | | | | | | | |
| Propane | 15,750 | 16,842 | 11,676 | 3,612 | 6,258 | 4,662 | 5,880 | 4,958 | 12,558 | 3,654 | 8,946 | 4,746 | 99,540 |
| Butane, normal | 148,003 | 119,478 | 102,980 | 105,427 | 81,810 | 75,077 | 95,629 | 110,611 | 134,257 | 183,704 | 209,849 | 228,363 | 1,595,188 |
| Isobutane | 73,715 | 73,890 | 70,690 | 66,101 | 76,782 | 79,693 | 84,257 | 74,357 | 81,959 | 66,154 | 75,835 | 80,463 | 903,896 |
| Butane-propane mixture | 5,292 | 3,906 | 8,736 | 5,628 | 6,090 | 5,628 | 5,754 | 5,922 | 5,082 | 5,880 | 5,418 | 6,678 | 70,014 |
| Other LP gas mixtures | 3,528 | 3,150 | 4,284 | 2,100 | 1,848 | 2,016 | 1,218 | 1,176 | 6,552 | 7,392 | 3,486 | 1,218 | 37,968 |
| Isopentane | 9,030 | 7,639 | 8,836 | 2,824 | 8,563 | 7,783 | 8,996 | 8,177 | 8,238 | 7,451 | 7,597 | 9,083 | 94,217 |
| Condensate | 90,831 | 83,924 | 83,449 | 75,852 | 73,004 | 73,221 | 78,827 | 79,192 | 77,962 | 81,024 | 88,798 | 96,346 | 982,430 |
| For other uses: | | | | | | | | | | | | | |
| Finished gasoline and naphtha | 46,702 | 40,579 | 47,407 | 44,129 | 44,923 | 43,687 | 38,841 | 37,145 | 40,057 | 41,680 | 47,778 | 38,106 | 511,034 |
| Ethane | 88,356 | 84,965 | 84,853 | 75,676 | 76,059 | 76,216 | 75,917 | 82,866 | 82,029 | 81,812 | 85,290 | 89,865 | 983,904 |
| LP gases: | | | | | | | | | | | | | |
| Propane | 683,288 | 506,719 | 424,799 | 353,507 | 311,543 | 314,175 | 349,502 | 388,675 | 380,655 | 456,178 | 471,758 | 727,152 | 5,367,951 |
| Butane, normal | 100,195 | 70,214 | 70,460 | 38,174 | 37,196 | 45,808 | 53,385 | 38,406 | 67,066 | 85,520 | 100,526 | 81,782 | 788,732 |
| Isobutane | 1,477 | 1,456 | 1,589 | 1,462 | 1,502 | 1,389 | 1,535 | 1,388 | 1,483 | 1,515 | 1,478 | 1,576 | 17,850 |
| Butane-propane mixture | 39,710 | 35,811 | 34,856 | 33,763 | 33,971 | 25,230 | 30,208 | 29,163 | 27,083 | 28,512 | 29,620 | 31,792 | 379,719 |
| Other LP gas mixtures | 27,023 | 31,211 | 26,180 | 25,492 | 32,768 | 23,193 | 37,702 | 55,402 | 43,576 | 43,317 | 39,191 | 40,779 | 425,834 |
| Other finished products | 23,804 | 19,443 | 20,601 | 19,180 | 21,168 | 19,662 | 18,335 | 16,186 | 16,711 | 15,604 | 16,999 | 22,844 | 230,537 |
| Total demand for natural gas liquids at plants and terminals | 1,763,290 | 1,481,537 | 1,418,130 | 1,265,784 | 1,249,006 | 1,230,463 | 1,358,802 | 1,408,562 | 1,442,478 | 1,547,723 | 1,623,837 | 1,892,685 | 17,682,297 |

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**TABLE 7.—Natural gas liquids utilized at refineries in the United States in 1964 by Bureau of Mines refinery districts and by months**

(Thousand gallons)

| District [1] | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Coast | 11,718 | 18,018 | 16,632 | 9,870 | 12,936 | 22,848 | 20,328 | 23,856 | 18,270 | 17,220 | 16,842 | 26,880 | 215,418 |
| Appalachian | 4,746 | 3,192 | 3,486 | 2,310 | 1,134 | 1,722 | 1,764 | 1,806 | 2,226 | 3,990 | 4,830 | 5,040 | 36,246 |
| Indiana, Illinois, Kentucky, etc. | 75,810 | 60,522 | 50,232 | 54,096 | 53,382 | 43,848 | 42,882 | 48,048 | 63,924 | 81,648 | 82,866 | 94,710 | 751,968 |
| Minnesota, Wisconsin, North Dakota, and South Dakota | 6,804 | 6,132 | 4,326 | 4,284 | 3,234 | 6,426 | 7,644 | 8,232 | 7,854 | 8,736 | 10,164 | 8,190 | 82,026 |
| Oklahoma, Kansas, Missouri | 76,104 | 60,732 | 63,756 | 54,684 | 62,370 | 62,496 | 62,958 | 62,496 | 65,520 | 71,652 | 79,506 | 84,714 | 806,988 |
| Texas: | | | | | | | | | | | | | |
| Inland | 82,614 | 73,710 | 77,910 | 84,546 | 92,232 | 84,210 | 88,452 | 96,684 | 89,208 | 84,126 | 77,994 | 77,280 | 1,008,966 |
| Gulf Coast | 235,032 | 230,370 | 239,442 | 238,812 | 237,006 | 216,594 | 244,776 | 246,876 | 261,324 | 260,358 | 268,338 | 264,516 | 2,943,444 |
| Total Texas | 317,646 | 304,080 | 317,352 | 323,358 | 329,238 | 300,804 | 333,228 | 343,560 | 350,532 | 344,484 | 346,332 | 341,796 | 3,952,410 |
| Louisiana-Arkansas: | | | | | | | | | | | | | |
| Louisiana Gulf Coast | 51,408 | 51,114 | 56,616 | 56,406 | 53,382 | 57,960 | 61,656 | 62,874 | 66,738 | 71,820 | 76,944 | 79,842 | 746,760 |
| Arkansas and Louisiana Inland | 27,552 | 25,620 | 26,922 | 25,410 | 28,560 | 25,998 | 25,200 | 25,242 | 27,048 | 29,736 | 29,274 | 28,728 | 325,290 |
| Total Louisiana-Arkansas | 78,960 | 76,734 | 83,538 | 81,816 | 81,942 | 83,958 | 86,856 | 88,116 | 93,786 | 101,556 | 106,218 | 108,570 | 1,072,050 |
| New Mexico | 4,452 | 3,696 | 3,906 | 3,486 | 4,536 | 6,300 | 5,460 | 5,334 | 5,062 | 5,166 | 4,284 | 3,402 | 55,104 |
| Other Rocky Mountain | 16,884 | 14,364 | 14,448 | 13,398 | 14,154 | 13,566 | 13,482 | 15,162 | 15,708 | 16,002 | 17,766 | 15,582 | 180,516 |
| West Coast | 83,202 | 80,682 | 83,202 | 79,002 | 82,656 | 82,320 | 85,806 | 87,780 | 94,122 | 88,704 | 89,166 | 98,994 | 1,035,636 |
| Total United States | 676,326 | 628,152 | 640,878 | 626,304 | 645,582 | 624,288 | 660,408 | 684,390 | 717,024 | 739,158 | 757,974 | 787,878 | 8,188,362 |

[1] Districts are described under the heading "Districts."

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**TABLE 8.—Percentage of natural gas liquids in refinery gasoline in the United States by Bureau of Mines refinery districts [1]**

| Year | East Coast | Appalachian | Indiana, Illinois, Kentucky, etc. | Minnesota, Wisconsin, North Dakota, and South Dakota | Oklahoma, Kansas, Missouri, etc. | Texas Inland | Texas Gulf Coast | Louisiana Gulf Coast | Arkansas and Lousiana Inland | Rocky Mountain | West Coast | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 1.0 | [2] | 5.3 | 3.6 | 11.1 | 35.6 | 13.5 | 13.5 | 35.7 | 7.8 | 13.4 | 11.0 |
| 1961 | 1.1 | [2] | 4.9 | 4.6 | 12.4 | 30.9 | 15.2 | 13.4 | 33.9 | 8.5 | 12.7 | 11.2 |
| 1962 | 1.3 | 0.7 | 5.1 | 5.4 | 12.4 | 31.0 | 17.8 | 14.2 | 34.2 | 7.5 | 11.6 | 11.9 |
| 1963 | 1.9 | 2.7 | 5.5 | 6.1 | 12.4 | 31.1 | 18.7 | 11.7 | 30.7 | 9.3 | 11.0 | 11.9 |
| 1964 | 2.5 | 2.4 | 5.8 | 7.1 | 12.0 | 30.9 | 18.1 | 11.7 | 31.0 | 8.8 | 11.0 | 11.6 |

[1] Bureau of Mines petroleum refining and PAD districts are described under the heading "Districts."
[2] Less than 0.5 percent.

**TABLE 9.—Liquefied petroleum gas and ethane produced at natural gas processing plants in 1964**

(Thousand gallons)

| States by petroleum districts | Propane | Butane-propane mix | Butane | Isobutane | Other LP gas | Total |
|---|---|---|---|---|---|---|
| District 1: | | | | | | |
| Western Pennsylvania | 960 | | 521 | | | 1,481 |
| West Virginia | [1] 112,394 | | [1] 62,158 | 6,653 | [2] 217,438 | [1] 398,643 |
| Total | 113,354 | | 62,679 | 6,653 | 217,438 | 400,124 |
| District 2: | | | | | | |
| Illinois | 89,169 | 70 | 24,845 | 13,521 | [2] 184,568 | 312,173 |
| Kentucky | [3] 64,196 | [3] 9,105 | [3] 17,472 | [3] 14,528 | [2] [3] 162,777 | [3] 268,078 |
| Michigan | [3] | [3] | [3] | [3] | [3] | [3] |
| Kansas | 307,991 | 1,035 | 156,731 | 46,990 | | 512,747 |
| Nebraska | 16,892 | | 7,664 | | | 24,556 |
| North Dakota | 50,609 | 1,066 | 32,663 | | | 84,338 |
| Oklahoma | 576,224 | 34,216 | 198,170 | 50,118 | 22,076 | 880,804 |
| Total | 1,105,081 | 45,492 | 437,545 | 125,157 | 369,421 | 2,082,696 |
| District 3: | | | | | | |
| Arkansas | 34,537 | 6,968 | 7,532 | 8,154 | 4,425 | 61,616 |
| Louisiana: | | | | | | |
| Gulf | 526,552 | 22,119 | 213,237 | 133,190 | [2] 40,570 | 935,668 |
| Inland | 170,693 | 43,976 | 67,532 | 29,615 | | 311,816 |
| Total Louisiana | 697,245 | 66,095 | 280,769 | 162,805 | 40,570 | 1,247,484 |
| Mississippi | 11,703 | 9,062 | 2,512 | | | 23,277 |
| New Mexico | 407,716 | 20,660 | 247,979 | 56,813 | 6,022 | 739,190 |
| Texas: | | | | | | |
| Gulf | 463,239 | 42,176 | 166,303 | 135,313 | [2] 364,168 | 1,171,199 |
| West | 1,132,362 | 92,727 | 603,243 | 47,102 | [2] 139,344 | 2,014,778 |
| East (field) | 53,342 | 2,093 | 40,965 | 390 | 11,131 | 107,921 |
| Panhandle | 396,746 | 14,690 | 191,186 | 239,296 | 34,407 | 876,325 |
| Other | 583,861 | 146,465 | 276,683 | 147,829 | [2] 196,175 | 1,351,013 |
| Total Texas | 2,629,550 | 298,151 | 1,278,380 | 569,930 | 745,225 | 5,521,236 |
| Total | 3,780,751 | 400,936 | 1,817,172 | 797,702 | 796,242 | 7,592,803 |
| District 4: | | | | | | |
| Colorado | 56,891 | | 7,192 | 8,254 | 16,579 | 88,916 |
| Montana | [4] 43,900 | 2,848 | 26,708 | | | 73,456 |
| Utah | [4] | | [4] | | | [4] |
| Wyoming | 95,998 | | 53,766 | | 3,218 | 152,982 |
| Total | 196,789 | 2,848 | 87,666 | 8,254 | 19,797 | 315,354 |
| District 5 | 250,420 | 11,112 | 51,648 | 19,880 | 19,554 | 352,614 |
| Grand total | 5,446,395 | 460,388 | 2,456,710 | 957,646 | [5] 1,422,452 | 10,743,591 |

[1] Florida included with West Virginia.
[2] Includes ethane production.
[3] Michigan included with Kentucky.
[4] Utah included with Montana.
[5] Includes 984,287,000 gallons of ethane products.

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**TABLE 10.—Liquefied petroleum gas and ethane (LR gas) produced at refineries in 1964**

(Thousand gallons)

| States by petroleum district | Propane | Butane-propane mix | Butane | Other LR gases | Total |
|---|---|---|---|---|---|
| District 1: | | | | | |
| East Coast [1] | 261,534 | | 44,436 | 11,382 | 317,352 |
| West New York | 25,956 | | 714 | | 26,670 |
| Pennsylvania | 166,868 | | 14,238 | 20,286 | 201,390 |
| West Virginia | | | | | |
| Total | 454,356 | | 59,388 | 31,668 | 545,412 |
| District 2: | | | | | |
| Illinois | 160,146 | | 4,326 | [2] 25,494 | 189,966 |
| Indiana | 131,082 | | 18,396 | 1,596 | 151,074 |
| Kansas | 91,392 | 126 | 18,186 | | 109,704 |
| Kentucky | [3] 28,770 | | | | 28,770 |
| Michigan | 55,650 | 2,394 | 1,638 | [2] 6,678 | 66,360 |
| Minnesota | [4] 68,166 | [4] 3,864 | [4] 8,442 | 672 | [4] 81,144 |
| Missouri | (4) | (4) | (4) | | (4) |
| North Dakota | (4) | (4) | (4) | | (4) |
| Wisconsin | (4) | (4) | (4) | | (4) |
| Ohio | 148,050 | | 798 | | 148,848 |
| Oklahoma | 98,196 | 49,392 | 30,786 | 42 | 178,416 |
| Total | 781,452 | 55,776 | 82,572 | 34,482 | 954,282 |
| District 3: | | | | | |
| Alabama | [5] | [5] | | | [5] |
| Arkansas | 43,218 | | 9,534 | 1,470 | 54,222 |
| Louisiana: | | | | | |
| Gulf | 207,396 | 6,930 | 14,196 | 223,020 | 451,542 |
| Inland | 210 | 1,848 | 7,434 | [2] 30,198 | 39,690 |
| Total Louisiana | 207,606 | 8,778 | 21,630 | 253,218 | 491,232 |
| Mississippi | [4] 10,374 | [4] 1,176 | | | [4] 11,550 |
| New Mexico | 5,292 | | 6,552 | | 11,844 |
| Texas: | | | | | |
| Gulf | 544,068 | 2,898 | 360,486 | [2] 786,828 | 1,694,280 |
| Inland | 85,722 | 1,512 | 42,420 | 378 | 130,032 |
| Total Texas | 629,790 | 4,410 | 402,906 | 787,206 | 1,824,312 |
| Total | 896,280 | 14,364 | 440,622 | 1,041,894 | 2,393,160 |
| District 4: | | | | | |
| Colorado | 6,930 | 168 | 2,730 | | 9,828 |
| Montana | 10,542 | | 1,260 | | 11,802 |
| Utah | 29,820 | | 1,218 | | 31,038 |
| Wyoming | 6,216 | | 9,072 | 4,998 | 20,286 |
| Total | 53,508 | 168 | 14,280 | 4,998 | 72,954 |
| District 5 | 253,974 | 23,562 | 127,512 | [2] 102,648 | 507,696 |
| Grand total | 2,439,570 | 93,870 | [6] 724,374 | [7] 1,215,690 | 4,473,504 |

[1] Excludes Pennsylvania.
[2] Includes ethane production.
[3] Propane produced in Tennessee is included with Kentucky.
[4] Missouri, North Dakota, and Wisconsin included with Minnesota.
[5] Alabama included with Mississippi.
[6] Includes 13,650,000 gallons of isobutane used in petrochemicals.
[7] Includes 353,304,000 gallons of ethane.

## PRICES

The average value for all natural gas liquids at plants in 1964 was 4.7 cents per gallon. The average value per gallon for all other products is not comparable with previous years because condensate was excluded from the other product category in the 1964 compilations. The average price for natural gasoline and isopentane remained at 6.5 cents. Value of LP gases and ethane declined 0.1 cent; finished

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gasoline and naphtha declined 0.7 cent; and other finished products and condensate increased 0.1 cent.

**TABLE 11.—Stocks of natural gas liquids and ethane in the United States**

(Thousand gallons)

| Date | Natural gasoline and isopentane | | LP gases and ethane | | Other finished products and plant condensate | | Total at plants and terminals | Total at refineries | Grand total |
|---|---|---|---|---|---|---|---|---|---|
| | At plants and terminals | At refineries | At plants and terminals | At refineries | At plants and terminals | At refineries | | | |
| Dec. 31: | | | | | | | | | |
| 1960 | 143,295 | 54,264 | 920,340 | 26,418 | 64,543 | 5,922 | 1,128,178 | 86,604 | 1,214,782 |
| 1961 | 136,490 | 62,118 | 1,263,892 | 30,198 | 54,166 | 9,954 | 1,454,548 | 102,270 | 1,556,818 |
| 1962 | 113,179 | 61,656 | 1,019,747 | 37,548 | 61,422 | 24,612 | 1,194,348 | 123,816 | 1,318,164 |
| 1963 | 100,188 | 68,040 | 1,132,750 | 33,306 | 67,412 | 15,666 | 1,300,350 | 117,012 | 1,417,362 |
| 1964: | | | | | | | | | |
| Jan. 31 | 102,779 | 69,300 | 907,078 | 31,668 | 64,234 | 19,194 | 1,074,091 | 120,162 | 1,194,253 |
| Feb. 29 | 105,892 | 63,042 | 857,255 | 35,070 | 69,062 | 20,034 | 1,032,209 | 118,146 | 1,150,355 |
| Mar. 31 | 115,148 | 67,620 | 951,688 | 33,054 | 68,876 | 19,488 | 1,135,712 | 120,162 | 1,255,874 |
| Apr. 30 | 120,204 | 69,846 | 1,117,440 | 40,908 | 69,555 | 17,430 | 1,305,199 | 128,184 | 1,433,383 |
| May 31 | 122,595 | 70,182 | 1,323,359 | 33,978 | 62,478 | 22,260 | 1,508,432 | 126,420 | 1,634,852 |
| June 30 | 115,252 | 71,064 | 1,497,111 | 31,542 | 55,194 | 15,960 | 1,667,557 | 118,566 | 1,786,123 |
| July 31 | 110,339 | 81,396 | 1,604,336 | 32,256 | 53,035 | 10,290 | 1,767,710 | 123,942 | 1,891,652 |
| Aug. 31 | 106,040 | 76,020 | 1,667,517 | 32,634 | 58,389 | 17,892 | 1,831,946 | 126,546 | 1,958,492 |
| Sept. 30 | 104,274 | 66,612 | 1,691,430 | 32,088 | 58,975 | 11,886 | 1,854,679 | 110,586 | 1,965,265 |
| Oct. 31 | 103,458 | 79,002 | 1,647,319 | 33,978 | 62,602 | 11,214 | 1,813,379 | 124,194 | 1,937,573 |
| Nov. 30 | 98,252 | 81,060 | 1,535,204 | 34,650 | 55,795 | 10,962 | 1,689,251 | 126,672 | 1,815,923 |
| Dec. 31 | 99,191 | 83,832 | [1] 1,205,745 | 37,968 | 56,889 | 14,868 | 1,361,825 | 136,668 | 1,498,493 |

[1] Includes 882 million gallons in underground storage.

## STOCKS

Natural gas liquids stocks at plants and terminals increased 61 million gallons during the year, and stocks at refineries increased 20 million gallons.

## STORAGE

Storage facilities for LP and LR gases increased 349 million gallons for the year ending September 30, 1964. Aboveground storage facilities increased 3 million gallons, and underground storage increased 346 million gallons. As of September 30, 1964, storage facilities for liquefied gases were filled to 49 percent of capacity, compared with 52 percent a year ago.

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**TABLE 12.—Liquefied petroleum gas storage capacity and stock, Sept. 30, 1964**

(Thousand gallons)

| State and district | Aboveground | | Underground at plants, terminals, and refineries | Total | Stocks as of Sept. 30, 1964 |
|---|---|---|---|---|---|
| | At plants and terminals | At refineries | | | |
| East Coast and Appalachian No. 1 [1] | 15,219 | 9,072 | 103,562 | ---- | ---- |
| Total PAD District 1 | 15,219 | 9,072 | 103,562 | 127,853 | 79,794 |
| Indiana, Illinois, Kentucky, and Appalachian No. 2: | | | | | |
| Indiana | (2) | (2) | (2) | ---- | ---- |
| Illinois | [3] 15,113 | [3] 15,036 | 71,087 | ---- | ---- |
| Kentucky | 4,340 | (4) | (2) | ---- | ---- |
| Ohio | 735 | [4] 12,180 | (2) | ---- | ---- |
| Michigan | 1,084 | 2,688 | [5] 171,866 | ---- | ---- |
| Tennessee | ---- | ---- | ---- | ---- | ---- |
| Oklahoma, Kansas, Minnesota, and Wisconsin: | | | | | |
| Oklahoma | 19,293 | 17,598 | 23,987 | ---- | ---- |
| Kansas | 8,595 | [5] 8,442 | 475,432 | ---- | ---- |
| Minnesota | (6) | 4,620 | 13,650 | ---- | ---- |
| Missouri, Nebraska, North Dakota, Iowa, and Wisconsin | [6] 8,781 | (5) | 64,360 | ---- | ---- |
| Total PAD District 2 | 57,941 | 60,564 | 820,382 | 938,887 | 663,736 |
| Texas Inland: | | | | | |
| Panhandle | 27,647 | (7) | 225,506 | ---- | ---- |
| East | 3,657 | (7) | ---- | ---- | ---- |
| West | 27,281 | [7] 25,704 | 356,089 | ---- | ---- |
| Other | 32,419 | (7) | 11,880 | ---- | ---- |
| Texas Gulf Coast | 22,173 | 37,758 | 1,318,013 | ---- | ---- |
| Louisiana Gulf Coast and Alabama | 15,748 | 16,128 | 288,270 | ---- | ---- |
| Arkansas and Louisiana Inland: | | | | | |
| Louisiana Inland | 6,805 | (8) | (9) | ---- | ---- |
| Arkansas | 2,359 | (8) | ---- | ---- | ---- |
| Mississippi | 814 | (8) | [9] 195,834 | ---- | ---- |
| New Mexico | 10,308 | (7) | 53,119 | ---- | ---- |
| Total PAD District 3 | 149,211 | 79,590 | 2,448,711 | 2,677,512 | 1,072,912 |
| Rocky Mountain: | | | | | |
| Montana and Utah | 1,568 | [10] 1,344 | [11] 20,122 | ---- | ---- |
| Wyoming | 3,281 | 2,772 | (11) | ---- | ---- |
| Colorado | 4,526 | (10) | ---- | ---- | ---- |
| Total PAD District 4 | 9,375 | 4,116 | 20,122 | 33,613 | 25,553 |
| West Coast | 3,446 | 32,340 | 35,700 | ---- | ---- |
| Total PAD District 5 | 3,446 | 32,340 | 35,700 | 71,486 | 41,333 |
| Total United States | 235,192 | 185,682 | 3,428,477 | 3,849,351 | [12] 1,883,328 |

[1] Includes storage capacity in Pennsylvania, West Virginia, Delaware, New Jersey, New York, Florida, and Georgia.
[2] Indiana included in Illinois.
[3] Kentucky, Indiana, and Ohio included in Michigan.
[4] Kentucky included in Ohio.
[5] Missouri, North Dakota, and Wisconsin included with Kansas.
[6] Minnesota included in Missouri, Nebraska, North Dakota, etc.
[7] Panhandle, East Texas, Other Texas, and New Mexico included in West Texas.
[8] Louisiana Inland, Mississippi, and Arkansas included in Louisiana Gulf Coast and Alabama.
[9] Louisiana Inland included in Mississippi.
[10] Colorado included in Montana and Utah.
[11] Wyoming included in Montana and Utah.
[12] Includes 1,373 million gallons in underground storage at plants and terminals, and 149 million gallons in underground storage at petroleum refineries.

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## SHIPMENTS OF LIQUEFIED PETROLEUM GASES [3] AND ETHANE

The total shipments of liquefied petroleum gases for domestic uses,[4] excluding liquefied petroleum gases used in the production of gasoline, were 12,473 million gallons in 1964, an increase of 8 percent for the year—the same as the 1963 increase. With the exception of liquefied petroleum gases used for secondary recovery of petroleum and by utilities for peak shaving, other end-use categories increased in 1964. More than three-quarters of the shipments of liquefied petroleum gases are for residential and commercial use and for chemical manufacture. Residential and commercial use in 1964 totaled 5,476 million gallons, an 8-percent increase for the year, and that used for chemical manufacture increased 7 percent to 4,021 million gallons.

**TABLE 13.—Shipments of liquefied petroleum gases and ethane in the United States, 1960–64**

(Thousand gallons)

| | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| United States, total | 11, 569, 846 | 11, 995, 275 | 13, 038, 581 | 14, 307, 543 | 15, 405, 210 |
| For export | 125, 537 | 149, 052 | 162, 735 | 193, 073 | 225, 346 |
| For use in gasoline production | 1, 899, 660 | 2, 048, 340 | 2, 146, 452 | 2, 544, 192 | 2, 706, 606 |
| For all other uses | 9, 544, 649 | 9, 797, 883 | 10, 729, 394 | 11, 570, 278 | 12, 473, 258 |
| By type: | | | | | |
| Ethane | 965, 175 | 1, 075, 957 | 1, 222, 615 | 1, 378, 284 | 1, 347, 025 |
| Propane | 5, 743, 694 | 5, 935, 967 | 6, 474, 558 | 7, 120, 976 | 7, 442, 817 |
| Butane | 1, 099, 544 | 1, 065, 513 | 1, 443, 081 | 1, 439, 891 | 1, 600, 398 |
| Isobutane | 15, 959 | 62, 279 | 41, 282 | 34, 264 | 31, 500 |
| Butane-propane mixture | 1, 093, 511 | 1, 107, 329 | 1, 077, 283 | 1, 054, 588 | 1, 107, 235 |
| All other mixtures | 626, 766 | 550, 838 | 470, 575 | 542, 275 | 944, 283 |
| By principal uses: | | | | | |
| Residential and commercial | 4, 224, 537 | 4, 318, 215 | 4, 712, 682 | 5, 053, 157 | 5, 475, 539 |
| Internal combustion | 897, 915 | 880, 315 | 931, 611 | 999, 363 | 1, 176, 260 |
| Industrial | 438, 559 | 402, 428 | 424, 730 | 493, 208 | 521, 006 |
| Refinery fuel | 157, 036 | 166, 572 | 221, 084 | 356, 958 | 439, 110 |
| Utility gas | 157, 041 | 168, 989 | 173, 481 | 216, 627 | 117, 004 |
| Chemical | 3, 019, 011 | 3, 239, 479 | 3, 571, 339 | 3, 771, 413 | 4, 020, 980 |
| Synthetic rubber | 538, 971 | 519, 637 | 587, 379 | 599, 556 | 651, 472 |
| Secondary recovery of petroleum | 53, 240 | 51, 683 | 41, 676 | 21, 319 | 9, 573 |
| Miscellaneous uses | 58, 239 | 50, 565 | 55, 412 | 58, 677 | 62, 314 |

[3] Data include liquefied refinery gases but exclude liquefied petroleum gases blended into gasoline.

[4] Description of the uses of liquefied petroleum gases reported in this section of the chapter:

*Residential and Commercial.*—All liquefied petroleum gases, by type, shipped or used in private households for heating, cooking, water heating, and other household uses, such as clothes dryers and incinerators. Shipments to nonmanufacturing organizations, such as motels, restaurants, retail stores, laundries and other service enterprises, primarily for use in space heating, water heating and cooking.

*Internal-Combustion Engine Fuel.*—All gases by type, used by tractors, irrigation engines, highway vehicles of all kinds, forklift and other industrial tractors, and also oilfield drilling and production uses.

*Industrial.*—Liquefied petroleum gases shipped or used by manufacturing plants of all types for standby fuel, space heating, or other such uses as flame cutting, metallurgical furnaces, and plumber's torches.

*Gas Companies.*—Shipments made to gas utility companies for distribution through the mains.

*Raw Material and Solvents for Chemical Plants and Synthetic Rubber Components.*—Shipments of liquefied petroleum gases made to chemical plants and for use in the production of synthetic rubber.

*All Other.*—Liquefied petroleum gases shipped or used for agriculture purposes such as flame cultivation, crop drying, tobacco curing, poultry breeding, and miscellaneous other farm uses.

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**Table 14.—Consumption of liquefied petroleum gases and ethane by use, excluding use in gasoline production, by PAD district and State**

(Thousand gallons)

| PAD district and State | Residential and commercial | | Internal combustion engine fuel | | Industrial fuel | | Utility gas | | Miscellaneous uses | | Total[1] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| District 1: | | | | | | | | | | | | |
| Connecticut | 35,116 | 30,050 | 472 | 834 | 13,373 | 17,117 | 7,010 | 9,800 | 1,433 | 1,305 | 57,413 | 60,011 |
| Delaware | 14,148 | 15,080 | 316 | 387 | 2,074 | 2,005 | 28 | | 14 | 43 | 16,580 | 18,425 |
| Florida | 207,110 | 223,262 | 23,046 | 23,072 | 8,378 | 12,150 | 12,118 | 8,078 | 776 | 408 | 251,427 | 267,064 |
| Georgia | 130,748 | 139,613 | 19,348 | 21,824 | 10,080 | 10,848 | 11,837 | 7,840 | 4,111 | 4,270 | 177,074 | 180,704 |
| Maine | 23,778 | 25,802 | 270 | 308 | 1,083 | 2,040 | 80 | 227 | 53 | 30 | 25,833 | 28,808 |
| Maryland and District of Columbia | 42,741 | 43,545 | 1,807 | 2,100 | 5,721 | 7,413 | 8,801 | 6,271 | 93 | 81 | 59,263 | 59,809 |
| Massachusetts | 40,004 | 40,053 | 1,100 | 1,414 | 5,060 | 10,100 | 8,109 | 4,807 | 117 | 540 | 55,008 | 57,040 |
| New Hampshire | 18,848 | 21,060 | 88 | 177 | 1,048 | 2,270 | 1,137 | 1,430 | 73 | 13 | 21,044 | 25,008 |
| New Jersey | 41,080 | 35,137 | 2,723 | 4,255 | 21,037 | 20,232 | 2,870 | 3,078 | 84 | 11 | 69,803 | 63,863 |
| New York | 117,873 | 138,707 | 5,104 | 6,284 | 11,015 | 12,004 | 1,031 | 1,007 | 104 | 101 | 135,017 | 160,111 |
| North Carolina | 104,300 | 112,229 | 2,040 | 1,801 | 10,213 | 11,801 | 1,180 | 1,300 | 12,000 | 16,170 | 130,409 | 143,430 |
| Pennsylvania | 67,543 | 75,080 | 6,842 | 8,502 | 29,107 | 32,505 | 4,177 | 997 | 90 | 91 | 107,859 | 117,031 |
| Rhode Island | 9,005 | 8,785 | 411 | 486 | 1,308 | 1,000 | 001 | 400 | | | 13,025 | 11,301 |
| South Carolina | 56,387 | 66,700 | 2,700 | 3,002 | 9,600 | 13,128 | 1,854 | 1,118 | 8,187 | 2,008 | 78,040 | 88,030 |
| Vermont | 11,051 | 17,710 | 84 | 76 | 1,242 | 1,204 | 1,405 | 1,170 | 8 | | 14,780 | 20,158 |
| Virginia | 55,130 | 60,540 | 2,772 | 3,406 | 7,450 | 7,707 | 4,534 | 5,381 | 1,213 | 1,434 | 71,109 | 78,807 |
| West Virginia | 17,755 | 15,131 | 1,010 | 745 | 1,237 | 1,323 | 40 | 144 | | | 20,001 | 17,348 |
| Total | 999,004 | 1,100,985 | 70,979 | 79,462 | 143,027 | 172,473 | 67,938 | 47,303 | 23,803 | 26,034 | 1,773,180 | 1,807,700 |
| District 2: | | | | | | | | | | | | |
| Illinois | 286,500 | 247,508 | 55,821 | 51,268 | 46,185 | 33,454 | 9,404 | 8,007 | 1,301 | 709 | 399,207 | 341,004 |
| Indiana | 202,030 | 184,300 | 10,403 | 9,130 | 51,002 | 49,287 | 6,032 | 2,673 | 1,418 | 1,370 | 270,941 | 246,070 |
| Iowa | 205,754 | 192,000 | 6,924 | 6,209 | 11,086 | 9,343 | 2,450 | 1,807 | 1,038 | 1,040 | 227,852 | 211,710 |
| Kansas | 200,003 | 177,307 | 50,378 | 42,356 | 7,142 | 7,013 | 403 | | 501 | 501 | 260,407 | 227,227 |
| Kentucky | 83,073 | 70,707 | 6,954 | 8,031 | 3,046 | 15,976 | 8,271 | 8,208 | 264 | 217 | 101,808 | 98,340 |
| Michigan | 128,441 | 115,546 | 5,454 | 4,052 | 12,071 | 15,205 | 5,547 | 3,013 | 458 | 1,040 | 152,071 | 140,146 |
| Minnesota | 178,826 | 177,272 | 6,865 | 6,454 | 23,207 | 23,023 | 5,570 | 2,773 | 1,111 | 1,470 | 215,570 | 211,007 |
| Missouri | 309,167 | 274,812 | 10,007 | 6,546 | 7,501 | 5,955 | 9,063 | 2,485 | 870 | 540 | 336,707 | 290,344 |
| Nebraska | 129,746 | 110,240 | 19,014 | 17,173 | 1,512 | 1,147 | 2,960 | 2,700 | 883 | 338 | 153,841 | 131,598 |
| North Dakota | 42,305 | 37,483 | 7,540 | 5,056 | 8,201 | 6,037 | 1,730 | 1,722 | 800 | 760 | 60,884 | 51,058 |
| Ohio | 98,788 | 101,524 | 9,482 | 10,486 | 17,186 | 16,553 | 30,020 | 10,888 | 1,233 | 1,105 | 157,310 | 140,256 |
| Oklahoma | 248,010 | 228,105 | 73,268 | 62,222 | 10,400 | 11,305 | | | 831 | 1,251 | 333,100 | 302,943 |
| South Dakota | 58,302 | 54,866 | 4,451 | 4,181 | 1,700 | 1,808 | 874 | 227 | 145 | 79 | 65,508 | 61,201 |
| Tennessee | 56,848 | 52,418 | 6,379 | 11,033 | 6,018 | 10,438 | 2,304 | 1,351 | 57 | 10 | 71,606 | 75,250 |
| Wisconsin | 170,082 | 177,156 | 5,590 | 4,901 | 34,282 | 27,722 | 2,912 | 1,535 | 600 | 475 | 223,505 | 211,789 |
| Total | 2,410,167 | 2,178,300 | 279,219 | 260,205 | 242,851 | 235,025 | 88,851 | 43,060 | 11,849 | 11,787 | 3,579,264 | 3,376,048 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **District 3:** | | | | | | | | | | | | |
| Alabama | 126,339 | 174,722 | 9,031 | 12,499 | 4,933 | 8,424 | 4,437 | 3,128 | 311 | 188 | 145,051 | 198,961 |
| Arkansas | 149,700 | 213,043 | 61,814 | 87,563 | 1,677 | 4,028 | ---------- | ---------- | 1,640 | 704 | 214,891 | 305,333 |
| Louisiana | 91,652 | 101,667 | 53,785 | 64,516 | 12,653 | 23,599 | ---------- | ---------- | 699 | 600 | 158,789 | 190,382 |
| Mississippi | 143,915 | 187,474 | 52,926 | 57,524 | 1,682 | 2,474 | 81 | 28 | 2,323 | 1,563 | 200,927 | 249,063 |
| New Mexico | 77,315 | 124,027 | 21,946 | 39,049 | 835 | 1,679 | 300 | 366 | 778 | 873 | 101,174 | 165,994 |
| Texas | 517,610 | 771,369 | 374,290 | 509,443 | 23,939 | 27,037 | 757 | 804 | 10,693 | 11,849 | 927,289 | 1,320,502 |
| Total | 1,106,591 | 1,572,302 | 573,792 | 770,594 | 45,719 | 67,236 | 5,575 | 4,326 | 16,444 | 15,777 | 5,236,923 | 6,164,189 |
| **District 4:** | | | | | | | | | | | | |
| Colorado | 102,428 | 130,625 | 10,471 | 12,333 | 3,284 | 2,593 | 470 | 620 | 1,211 | 665 | 117,864 | 146,836 |
| Idaho | 15,974 | 19,882 | 1,795 | 1,912 | 4,193 | 5,427 | ---------- | ---------- | 405 | 174 | 22,367 | 27,395 |
| Montana | 24,674 | 32,362 | 5,281 | 4,269 | 2,125 | 2,434 | ---------- | ---------- | 25 | 20 | 32,105 | 39,085 |
| Utah | 16,374 | 19,624 | 4,454 | 3,523 | 949 | 2,120 | ---------- | ---------- | 57 | 40 | 21,834 | 25,316 |
| Wyoming | 25,267 | 27,729 | 9,874 | 11,453 | 23,168 | 4,574 | ---------- | ---------- | 21 | 41 | 38,330 | 43,797 |
| Total | 184,717 | 230,222 | 31,875 | 33,490 | 13,719 | 17,157 | 470 | 620 | 1,719 | 940 | 259,735 | 307,425 |
| **District 5:** | | | | | | | | | | | | |
| Alaska | 3,299 | 3,585 | 12 | 27 | ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 3,311 | 3,612 |
| Arizona | 35,830 | 37,578 | 5,483 | 5,329 | 388 | 280 | ---------- | ---------- | 592 | 425 | 42,293 | 43,621 |
| California | 233,962 | 244,576 | 33,799 | 32,292 | 36,090 | 23,039 | 26,494 | 12,179 | 3,245 | 5,870 | 333,590 | 317,956 |
| Hawaii | 4,783 | 5,073 | 129 | 494 | 361 | 162 | 4,437 | 5,140 | ---------- | ---------- | 9,710 | 10,909 |
| Nevada | 20,977 | 25,381 | 817 | 1,775 | 224 | ---------- | 15,486 | 3,040 | ---------- | ---------- | 37,504 | 30,196 |
| Oregon | 20,249 | 37,231 | 1,675 | 879 | 6,780 | 847 | 7,181 | 616 | 84 | 152 | 35,969 | 39,725 |
| Washington | 36,588 | 40,306 | 1,583 | 1,633 | 3,169 | 4,778 | 208 | 621 | 851 | 729 | 42,399 | 48,067 |
| Total | 355,688 | 393,730 | 43,498 | 42,429 | 47,012 | 29,115 | 53,806 | 21,596 | 4,772 | 7,176 | 721,224 | 757,806 |
| Total United States shipments | 5,053,157 | 5,475,539 | 999,363 | 1,176,260 | 493,208 | 521,006 | 216,627 | 117,004 | 58,677 | 62,314 | 11,570,278 | 12,473,258 |

[1]District totals do not equal the sum of State totals because of the inclusion in district totals and the exclusion in State totals of figures for refinery fuel, chemical, synthetic rubber, and secondary recovery uses to avoid disclosing company data. Data for these uses are shown in table 16.

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**TABLE 15.—Consumption of liquefied petroleum gases and ethane, by type, by PAD district and State**

(Thousand gallons)

| PAD district and State | Propane | | Butane | | Butane-propane mixture | | Total | |
|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| District 1: | | | | | | | | |
| Connecticut | 57,373 | 60,899 | 22 | | 18 | 12 | 57,413 | 60,911 |
| Delaware | 17,114 | 18,390 | | | 66 | 85 | 17,180 | 18,475 |
| Florida | 215,222 | 236,867 | 357 | 366 | 36,458 | 30,430 | 252,037 | 267,663 |
| Georgia | 141,535 | 155,100 | 2,577 | 3,035 | 32,912 | 31,628 | 177,024 | 189,763 |
| Maine | 25,833 | 28,503 | | | | | 25,833 | 28,503 |
| Maryland and District of Columbia | 58,989 | 59,192 | | | 263 | 308 | 59,252 | 59,500 |
| Massachusetts | 55,289 | 57,627 | | | 216 | 313 | 55,505 | 57,940 |
| New Hampshire | 21,398 | 25,098 | 646 | 767 | | | 22,044 | 25,865 |
| New Jersey | 68,555 | 83,156 | 13 | 29 | 335 | 378 | 68,903 | 83,563 |
| New York | 135,602 | 158,002 | 24 | 13 | 1,391 | 1,098 | 137,017 | 159,113 |
| North Carolina | 128,067 | 140,448 | 38 | 36 | 2,303 | 1,946 | 130,408 | 142,430 |
| Pennsylvania | 102,261 | 112,924 | 1,885 | 1,169 | 3,712 | 3,738 | 107,858 | 117,831 |
| Rhode Island | 12,675 | 11,302 | | | | | 12,675 | 11,302 |
| South Carolina | 66,041 | 78,093 | 69 | 169 | 7,560 | 9,758 | 73,670 | 88,020 |
| Vermont | 14,750 | 20,118 | | | | | 14,750 | 20,118 |
| Virginia | 70,660 | 78,220 | 437 | 347 | 11 | | 71,108 | 78,567 |
| West Virginia | 20,022 | 17,325 | | | 29 | 18 | 20,051 | 17,343 |
| Total [1] | 1,250,757 | 1,392,737 | 69,151 | 71,830 | 86,399 | 81,638 | [2] 1,773,132 | [2] 1,867,790 |
| District 2: | | | | | | | | |
| Illinois | 390,956 | 336,070 | 5,974 | 4,184 | 2,467 | 1,439 | 399,397 | 341,693 |
| Indiana | 269,110 | 214,544 | 3,236 | 1,808 | 495 | 324 | 272,841 | 216,676 |
| Iowa | 227,586 | 211,522 | 191 | 197 | 75 | | 227,852 | 211,719 |
| Kansas | 225,061 | 208,123 | 15,801 | 6,413 | 18,605 | 12,701 | 259,467 | 227,237 |
| Kentucky | 101,025 | 96,616 | 213 | 222 | 1,590 | 1,511 | 102,828 | 98,349 |
| Michigan | 152,159 | 139,778 | 180 | 176 | 232 | 192 | 152,571 | 140,146 |
| Minnesota | 210,542 | 205,743 | 4,847 | 5,770 | 190 | 84 | 215,579 | 211,597 |
| Missouri | 327,247 | 280,257 | 3,404 | 3,112 | 6,146 | 6,975 | 336,797 | 290,344 |
| Nebraska | 152,367 | 136,285 | 828 | 719 | 646 | 594 | 153,841 | 137,598 |
| North Dakota | 52,866 | 45,598 | 2,856 | 2,139 | 4,862 | 3,311 | 60,584 | 51,048 |
| Ohio | 157,315 | 140,256 | | | | | 157,315 | 140,256 |
| Oklahoma | 254,348 | 247,667 | 22,797 | 17,400 | 56,051 | 37,876 | 333,196 | 302,943 |
| South Dakota | 63,770 | 60,223 | 178 | 110 | 1,620 | 928 | 65,568 | 61,261 |
| Tennessee | 66,927 | 70,878 | 514 | 360 | 5,065 | 4,612 | 72,506 | 75,850 |
| Wisconsin | 212,328 | 203,756 | 9,960 | 7,832 | 277 | 201 | 222,565 | 211,789 |
| Total [1] | 3,040,402 | 2,821,554 | 169,384 | 164,421 | 114,775 | 104,377 | [2] 3,579,264 | [2] 3,376,048 |
| District 3: | | | | | | | | |
| Alabama | 107,203 | 152,211 | 2,836 | 3,044 | 35,011 | 43,706 | 145,050 | 198,961 |
| Arkansas | 150,585 | 229,688 | 8,570 | 14,511 | 55,736 | 61,134 | 214,891 | 305,333 |
| Louisiana | 69,572 | 111,571 | 9,443 | 6,040 | 79,774 | 72,771 | 158,789 | 190,382 |
| Mississippi | 125,154 | 167,049 | 7,399 | 8,014 | 68,375 | 74,000 | 200,928 | 249,063 |
| New Mexico | 85,264 | 143,223 | 2,727 | 4,969 | 13,183 | 17,802 | 101,174 | 165,994 |
| Texas | 429,959 | 780,437 | 54,328 | 76,661 | 443,002 | 463,404 | 927,289 | 1,320,503 |
| Total [1] | 2,065,942 | 2,429,953 | 1,140,092 | 1,250,453 | 767,003 | 845,158 | [2] 5,236,923 | [2] 6,164,189 |

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**TABLE 15.—Consumption of liquified petroleum gases and ethane, by type, by PAD district and State—Continued**

(Thousand gallons)

| PAD district and State | Propane | | Butane | | Butane-propane mixture | | Total | |
|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| District 4: | | | | | | | | |
| Colorado | 113,521 | 145,323 | 693 | 348 | 3,435 | 1,165 | 117,649 | 146,836 |
| Idaho | 22,362 | 27,245 | | | 220 | 150 | 22,582 | 27,395 |
| Montana | 29,306 | 36,469 | 1,055 | 838 | 1,744 | 1,778 | 32,105 | 39,085 |
| Utah | 21,485 | 24,824 | 12 | 7 | 337 | 485 | 21,834 | 25,316 |
| Wyoming | 33,557 | 38,590 | 138 | 76 | 4,635 | 5,131 | 38,330 | 43,797 |
| Total [1] | 233,487 | 281,144 | 10,841 | 13,324 | 15,407 | 12,957 | [2] 259,735 | [2] 307,425 |
| District 5: | | | | | | | | |
| Alaska | 3,311 | 3,590 | | | | 22 | 3,311 | 3,612 |
| Arizona | 37,864 | 39,788 | 326 | | 4,103 | 3,833 | 42,293 | 43,621 |
| California | 277,574 | 267,726 | | 1,377 | 56,016 | 48,853 | 333,590 | 317,956 |
| Hawaii | 4,927 | 10,869 | | | 4,783 | | 9,710 | 10,869 |
| Nevada | 37,421 | 30,136 | | | 83 | 60 | 37,504 | 30,196 |
| Oregon | 34,272 | 37,811 | | | 1,697 | 1,914 | 35,969 | 39,725 |
| Washington | 40,137 | 46,066 | | | 2,262 | 2,001 | 42,399 | 48,067 |
| Total [1] | 530,388 | 517,429 | 50,423 | 100,370 | 71,004 | 63,105 | [2] 721,224 | [2] 757,806 |
| Total United States shipments | 7,120,976 | 7,442,817 | 1,439,891 | 1,600,398 | 1,054,588 | 1,107,235 | 11,570,278 | 12,473,258 |

[1] District totals do not equal the sum of State totals because of the inclusion in district totals and the exclusion in State totals of figures for refinery fuel, chemical, synthetic rubber, and secondary recovery uses to avoid disclosing company data. Data for these uses are shown in table 8.
[2] Includes ethane, isobutane, and all other mixtures. See table 8.

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**TABLE 16.—Consumption of liquefied petroleum gases and ethane for chemical, synthetic rubber, refinery fuel, and secondary recovery of petroleum uses, by type, by PAD district[1]**

(Thousand gallons)

| Use and PAD district | Ethane | | Propane | | Butane | | Isobutane | | Butane-propane mixture | | All other mixtures | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| Chemical: | | | | | | | | | | | | | | |
| District 1 | 347,106 | 275,607 | 35,943 | 46,389 | 59,783 | 61,899 | 1,057 | 1,128 | 125 | 90 | 18,662 | 44,850 | 462,676 | 429,963 |
| District 2 | 237,122 | 240,661 | 49,017 | 55,524 | 44,521 | 51,199 | 2,533 | 2,220 | 338 | 481 | 15,048 | 42,815 | 348,579 | 392,900 |
| District 3 | 783,362 | 819,585 | 1,035,821 | 765,161 | 543,080 | 535,958 | 30,528 | 28,152 | 65,934 | 102,931 | 369,531 | 744,940 | 2,828,256 | 2,996,727 |
| District 4 | | | | | | | | | | | | | | |
| District 5 | 10,694 | 11,172 | 50,498 | 57,540 | 11,969 | 63,378 | 146 | | 26 | 3,570 | 58,569 | 65,730 | 131,902 | 201,390 |
| Total | 1,378,284 | 1,347,025 | 1,171,279 | 924,614 | 659,353 | 712,434 | 34,264 | 31,500 | 66,423 | 107,072 | 461,810 | 898,335 | 3,771,413 | 4,020,980 |
| Synthetic rubber: | | | | | | | | | | | | | | |
| District 1 | | | | | | | | | | | | | | |
| District 2 | | | | | | | | | | | | | | |
| District 3 | | | | | 493,093 | 576,712 | | | | | 80,465 | 45,948 | 573,558 | 622,660 |
| District 4 | | | | | | | | | | | | | | |
| District 5 | | | | | 25,998 | 28,812 | | | | | | | 25,998 | 28,812 |
| Total | | | | | 519,091 | 605,524 | | | | | 80,465 | 45,948 | 599,556 | 651,472 |

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Refinery fuel: | | | | | | | | | | | | | |
| District 1 | ---- | ---- | 3,428 | 5,084 | 3,300 | 4,000 | ---- | ---- | 1,000 | 1,836 | ---- | 7,728 | 10,920 |
| District 2 | ---- | ---- | 127,778 | 168,714 | 53,884 | 62,780 | ---- | ---- | 16,116 | 33,148 | ---- | 197,778 | 264,642 |
| District 3 | ---- | ---- | 57,506 | 77,136 | 18,616 | 24,844 | ---- | ---- | 8,968 | 9,410 | ---- | 82,110 | 111,090 |
| District 4 | ---- | ---- | 6,486 | 7,298 | 8,344 | 11,806 | ---- | ---- | 8,036 | 4,248 | ---- | 19,866 | 23,352 |
| District 5 | ---- | ---- | 37,292 | 20,490 | 12,130 | 6,803 | ---- | ---- | 54 | 1,813 | ---- | 49,476 | 20,106 |
| Total | ---- | ---- | 232,490 | 278,722 | 96,274 | 109,933 | ---- | ---- | 28,194 | 50,455 | ---- | 356,958 | 439,110 |
| Secondary recovery of petroleum: | | | | | | | | | | | | | |
| District 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| District 2 | ---- | ---- | 4,878 | 3,477 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 4,878 | 3,477 |
| District 3 | ---- | ---- | 6,770 | 1,895 | 599 | 249 | ---- | ---- | ---- | ---- | ---- | 7,369 | 1,644 |
| District 4 | ---- | ---- | 7,092 | 3,413 | ---- | ---- | ---- | ---- | 1,980 | 1,039 | ---- | 9,072 | 4,452 |
| District 5 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| Total | ---- | ---- | 18,740 | 8,285 | 599 | 249 | ---- | ---- | 1,980 | 1,039 | ---- | 21,319 | 9,573 |
| Total: | | | | | | | | | | | | | |
| District 1 | 347,106 | 275,607 | 89,371 | 51,473 | 63,083 | 65,899 | 1,057 | 1,128 | 1,125 | 1,926 | 18,662 | 470,404 | 440,883 |
| District 2 | 237,122 | 240,661 | 176,795 | 224,238 | 98,405 | 113,979 | 2,533 | 2,220 | 16,454 | 33,620 | 15,048 | 546,357 | 667,642 |
| District 3 | 783,362 | 819,585 | 1,096,205 | 845,774 | 1,054,789 | 1,137,214 | 30,528 | 28,152 | 71,922 | 112,241 | 449,996 | 3,488,802 | 3,733,904 |
| District 4 | ---- | ---- | 13,256 | 8,693 | 8,943 | 12,055 | ---- | ---- | 5,036 | 4,248 | ---- | 27,235 | 24,996 |
| District 5 | 10,694 | 11,172 | 94,892 | 81,443 | 50,097 | 98,988 | 146 | ---- | 2,060 | 6,422 | 58,569 | 216,448 | 263,760 |
| Total United States | 1,378,284 | 1,347,025 | 1,422,509 | 1,211,621 | 1,275,317 | 1,428,140 | 34,264 | 31,500 | 96,597 | 158,566 | 542,275 | 944,283 | 4,749,246 | 5,121,185 |

[1] State figures not shown to avoid disclosure of individual company data.

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## FOREIGN TRADE

The imports and exports statistics included in this section were compiled by the U.S. Department of Commerce and differ slightly from those used in other sections of this chapter. The Bureau of Mines import data exclude from United States totals all imports from foreign sources to U.S. territories and possessions. Exports of liquefied gases totaled 225 million gallons, 32 million more than in 1963. As in past years, Mexico was the principal importer of LP gases from the United States, receiving 94 percent of the total exports.

**TABLE 17.—LP gases [1] exported from the United States, by country or area**

(Thousand gallons [2])

| Country or area | 1955–59 (average) | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|
| North America: | | | | | | |
| Canada | 37,528 | 5,251 | 4,134 | 3,657 | 6,347 | 4,900 |
| Mexico | 91,060 | 111,858 | 121,890 | 148,931 | 177,748 | 211,141 |
| Bermuda and Caribbean | 4,169 | 3,791 | 3,366 | 2,031 | 2,494 | 2,219 |
| Central America | 1,737 | 456 | 489 | 628 | 438 | 88 |
| Other | 5,804 | ---- | ---- | ---- | ---- | ---- |
| Total | 140,298 | 121,356 | 129,879 | 155,247 | 187,027 | 218,348 |
| South America: | | | | | | |
| Argentina | 244 | 3,818 | 14,514 | 3,518 | 9 | 1,060 |
| Brazil | 10,473 | ---- | 454 | 18 | 169 | 425 |
| Other | 264 | 32 | 34 | 223 | 89 | 51 |
| Total | 10,981 | 3,850 | 15,002 | 3,759 | 267 | 1,536 |
| Europe: | | | | | | |
| Denmark | 128 | ---- | 24 | 22 | 336 | 13 |
| France | 33 | (3) | 149 | 113 | 2,113 | 427 |
| Germany, West | 95 | (3) | 528 | 1,353 | 1,416 | 2,461 |
| Italy | 202 | 21 | 399 | 489 | 436 | 40 |
| Netherlands | 9 | ---- | 133 | 132 | 187 | 84 |
| Sweden | 29 | 19 | (3) | 10 | 10 | 7 |
| United Kingdom | 40 | 15 | 1,566 | 354 | 174 | 429 |
| Other | 22 | ---- | 46 | 106 | 78 | 156 |
| Total | 558 | 55 | 2,845 | 2,579 | 4,750 | 3,617 |
| Asia: | | | | | | |
| Israel | 25 | ---- | 9 | 15 | 27 | 71 |
| Japan | 229 | 23 | 673 | 374 | 172 | 245 |
| Phillippines | 92 | ---- | ---- | ---- | 24 | ---- |
| Thailand | ---- | ---- | ---- | ---- | 11 | 300 |
| Other | 17 | 2 | 22 | 8 | 21 | 42 |
| Total | 363 | 25 | 704 | 397 | 255 | 658 |
| Africa | 119 | 6 | 212 | 325 | 109 | 172 |
| Oceania | 124 | 245 | 410 | 428 | 665 | 1,015 |
| Grand total | 152,443 | 125,537 | 149,052 | 162,735 | 193,073 | 225,346 |

[1] Data include LR gases.
[2] 4.5 pounds = 1 gallon.
[3] Less than 1,000 gallons.

Source: Bureau of the Census.

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TABLE 18.—Natural gasoline exported from the United States, by countries

(Thousand gallons)

| Country | 1955–59 (average) | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|
| Bahamas | 1 | | | | 139 | 135 |
| Canada | 3,166 | 15 | 61 | 239 | 470 | |
| Mexico | 26 | 38 | 40 | 35 | 60 | 399 |
| Turkey | | | 24 | | | |
| United Kingdom | | | 140 | | | 11 |
| Other countries | | | 80 | 90 | 145 | 73 |
| Total | 3,193 | 53 | 345 | 364 | 814 | 618 |

Source: Bureau of the Census.

## TECHNOLOGY

**Sulfinol Process.**[5]—The first commercial application of a new process for removing acidic gases hydrogen sulfide ($H_2S$), carbon dioxide ($CO_2$), and carbonyl sulfide (COS), as well as mercaptans, from natural gas being processed for natural gas liquids was started in March 1964 at the Person Gas Plant of Shell Oil Company in Karnes County, Texas. The process is called Sulfinol and uses a solvent composed of an alkanolamine admixed with an organic chemical named sulfolane. In this installation the plant was converted from using an MEA (monoethanolamine) acid gas absorption system which processed gas from 1,000-pound-per-square-inch oilfield separators that contained 1.6 percent $H_2S$ and 6.9 percent $CO_2$. The change was made because of the process advantages and economics the new treating system offers, according to the operators.

In general, the new process absorber operates more smoothly and without the frequent attention required by the amine process while maintaining a very low and precise control of the $H_2S$ content of the residue gas stream. Miscellaneous labor consuming items that are common in MEA operations, such as cleaning of filters and exchangers, solvent reclamation, and solvent makeup have required little attention within the brief operating time of this plant.

Several other installations of the new process in addition to the Person plant have been made in related applications for treating light gases. Three of these units are in operation removing $CO_2$ from crude hydrogen being used as feedstock for ammonia synthesis and hydrofining processes; two, removing $H_2S$ and COS from the process streams in a partial oxidation gas process for generating hydrogen; and one, removing $CO_2$ for a natural gas stream. Fourteen other units of this new type are in design or under construction in plants producing natural gas liquids and in closely associated process operations.

**Cryogenics in Gas Processing Industry.**[6]—Cryogenics is being applied increasingly in natural gas and LNG processing. It is the science and technology of supercold fluids. The word is derived from the Greek word "Kryos," which means "cold." The upper limit of

[5] C. L. Dunn, E. R. Freitas, and E. S. Hill. "Sulfinol" Process in Commercial Operation. Proc. of the Forty-fourth Ann. Convention of Nat. Gas Processors Assoc., Dallas, Tex., Mar. 24–26, 1965, pp. 55–58.

[6] A. W. Mellen. Cryogenics and the Gas Processing Industry. Proc. of the Forty-fourth Ann. Convention of Nat. Gas Processors Assoc., Dallas, Tex., Mar. 24–26, 1965, pp. 12–17.

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the cryogenic temperature range is not well defined and this point is often debated, but the lower limit is precisely fixed at absolute zero, which has been approached closely though not as yet attained. Cryogenics in practice usually includes those temperatures below minus 250° F., but some groups place the dividing line at temperatures as high as minus 150° F.

The greatest use of cryogenics in the lower temperature range in natural gas processing has been for the recovery of helium. Every helium-recovery plant in operation has used cryogenic techniques to extract the product from natural gas, despite substantial development efforts with high-temperature diffusion processes.

In the less cold range, cryogenics has been applied successfully to natural gas liquid processing utilizing propane refrigeration for process cooling and control, especially at plants in locations deficient in cooling water. An extension of this cryogenic application to lower temperatures has led to liquefied natural gas (LNG) in commercial applications. LNG now is being transported from Africa to England overseas in specially constructed ships and delivered to gas-deficient areas. LNG also is finding increasing use in gas pipeline peak shaving operations in the United States. LNG is now rapidly becoming the major interest in gas processing cryogenics. Several commercial projects have been completed within 1964 and others are well underway. One LNG peak shaving project was completed in New Jersey in 1964, and two were under construction in Alabama and California at the end of the year.

LNG plants have required the development of refrigeration systems to remove heat down to a temperature of minus 258° F., the normal boiling point of methane. The cascade-type system, which uses propane, ethane, and methane as refrigerants, has been used the most. An important development in this system has been the use of an expansion engine cycle for pressure let-down that also is a means of providing refrigeration for liquefaction. Since natural gas distribution systems operate at pressures significantly less than the transmission systems which supply them, there are many pressure reduction stations that waste the energy obtained from gas throttling. Efforts to convert this wasted energy into electrical energy by means of an expansion turbine have not been possible because of marginal economics, and there has not been a use for the refrigeration obtained from an expansion engine.

Uses are now being found for this refrigeration in natural gas liquefaction and LP gas processing, and especially for the recovery of ethane and other LP gases which, as relatively pure hydrocarbons feedstocks, are being extracted at a growing rate for use in the rapidly expanding chemical, rubber, and petrochemical industries.

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# Crude Petroleum and Petroleum Products

By James G. Kirby [1] and Betty M. Moore [2]

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## GENERAL SUMMARY

TOTAL DEMAND [3] for all oils in 1964 was 11,061,000 barrels daily, an increase of 2.8 percent over the 1963 daily average of 10,759,000. Domestic demand increased 2.9 percent to 10,859,000 barrels daily. Exports in 1964 were a little lower than in 1963, but much higher than in 1961 and 1962. The total new supply of all oils in 1964 was 11,071,000 barrels daily. Domestic crude oil pro-

[1] Industry economist, Division of Petroleum.
[2] Statistical assistant, Division of Statistics.
[3] Certain terms as used in this chapter are more or less unique to the petroleum industry. Principal terms and their meaning are:
*Total demand.*—A derived figure representing total new supply plus decreases or minus increases in reported stocks. Because there are substantial secondary and consumer's stocks that are not reported to the Bureau of Mines, this figure varies considerably from consumption.
*Domestic demand.*—Total demand less exports.
*New supply of all oils.*—The sum of crude oil production plus production of natural gas liquids, plus benzol (coke-oven) used for motor fuel, plus imports of crude oil and other petroleum products.
*Transfers.*—Crude oil conveyed to fuel-oil stocks without processing, or reclassification of products from one product category to another.
*All oils.*—Crude petroleum, natural gas liquids, and their derivatives.
*Principal product.*—Gasoline, kerosine, distillate fuel, and residual fuel oil.



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**TABLE 1.—Salient statistics of crude petroleum, refined products, and natural gas liquids in the United States**

| | 1960 | 1961 | 1962 | 1963 | p 1964 |
|---|---|---|---|---|---|
| Crude petroleum: | | | | | |
| Domestic production...thousand barrels [1] | 2,574,933 | 2,621,758 | 2,676,189 | 2,752,723 | 2,786,822 |
| World production...do | 7,688,668 | 8,183,899 | 8,882,227 | 9,537,420 | 10,327,591 |
| U.S. proportion...percent | 33 | 32 | 30 | 29 | 27 |
| Imports [2]...thousand barrels [1] | 371,575 | 381,548 | 411,039 | 412,660 | 438,643 |
| Exports [3]...do | 3,087 | 3,227 | 1,790 | 1,698 | 1,363 |
| Stocks, end of year...do | 239,800 | 244,864 | 252,011 | 257,361 | 230,057 |
| Runs to stills...do | 2,952,534 | 2,987,158 | 3,069,631 | 3,170,652 | 3,241,632 |
| Value of domestic production at wells: | | | | | |
| Total...thousand dollars | 7,420,181 | 7,565,582 | 7,774,051 | 7,965,743 | 8,017,078 |
| Average per barrel | $2.88 | $2.89 | $2.90 | $2.89 | $2.88 |
| Total producing oils wells December 31 | 591,158 | 594,917 | 596,385 | r 588,657 | 588,225 |
| Total oil wells completed during year (successful wells) | 22,492 | 21,850 | 21,372 | 20,288 | 20,620 |
| Refined products: | | | | | |
| Imports [4]...thousand barrels [1] | 292,536 | 318,118 | 348,754 | 362,053 | 388,200 |
| Exports [3]...do | 70,819 | 60,336 | 59,600 | 74,216 | 72,405 |
| Stocks, end of year...do | 515,827 | 543,343 | r 553,848 | 564,451 | 573,499 |
| Output of gasoline [5]...do | 1,522,497 | 1,534,462 | 1,583,376 | 1,625,198 | 1,706,005 |
| Yield of gasoline...percent | 45.1 | 44.7 | 44.8 | 44.1 | 45.2 |
| Average dealers' net price (excluding tax) of gasoline in 55 U.S. cities cents per gallon [7] | 16.08 | 15.80 | 15.45 | 15.22 | 14.82 |
| Completed refineries, end of year | 311 | 311 | 308 | 304 | 300 |
| Daily crude-oil capacity thousand barrels [1] | 10,010 | 10,105 | 10,118 | 10,385 | 10,773 |
| Natural gas liquids: | | | | | |
| Production...do | 340,157 | 361,689 | 372,705 | 400,886 | 419,924 |
| Stocks, end of year...do | 28,931 | 37,067 | 31,385 | 33,747 | 35,679 |

p Preliminary (except for crude production and value). r Revised.
[1] 42 gallons per barrel.
[2] Bureau of Mines data for crude oil and unfinished oils.
[3] U.S. Department of Commerce data.
[4] U.S. Department of Commerce data, except for unfinished oils.
[5] New basis. These data are comparable to 1963 because of product reclassification resulting from separately reporting data for petrochemical feedstocks.
[6] Beginning with 1961 excludes unfinished gasoline.
[7] Platt's Oil Price Handbook.

duction, 7,664,000 barrels daily (preliminary figure), represented 69.2 percent of the supply; natural gas liquids production, 10.4 percent; and imports of crude oil and refined products, 20.4 percent.

## DEMAND BY PRODUCTS

As most of the indicated consumption of crude oil in the United States is converted into products at refineries, before sale to ultimate consumers, the analysis of demand trends involves consideration of each major product. The fuel oils (residual, distillate, and kerosine) compete directly with natural gas or coal in heating, cooking, and industrial uses. Gasoline and diesel fuel are the major fuels used in the transportation field, followed by jet fuel (a blend of low-grade gasoline, kerosine, and distillate) used in military jetplanes, and straight kerosine which is used as fuel by commercial jetplanes. The other products serve a wide variety of uses and are in competition with other refined products both for fuel and nonfuel uses.

Petrochemical feedstocks produced at refineries are being reported as a separate product, as was done for the first time with 1963 data. This eliminates products used for chemical manufacture from the other petroleum products. For this reason, in 1963 and 1964 data on demands for individual petroleum products are not strictly comparable to the statistics published for earlier years.

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**TABLE 2.—Supply and demand of all oils in the United States, 1963–64 by months and totals for 1962–64**

(Thousand barrels)

| | 1963 | | | | | | | | | | | | | 1962 total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | March | April | May | June | July | August | September | October | November | December | Total | |
| New supply: | | | | | | | | | | | | | | |
| Domestic production: | | | | | | | | | | | | | | |
| Crude petroleum | 226,420 | 212,437 | 234,289 | 228,270 | 234,499 | 226,853 | 235,144 | 236,830 | 225,207 | 233,610 | 226,321 | 232,843 | 2,752,723 | 2,678,189 |
| Natural gas liquids | 33,520 | 32,136 | 34,407 | 31,932 | 33,053 | 31,907 | 33,236 | 34,012 | 32,773 | 34,089 | 34,280 | 35,541 | 400,886 | 372,705 |
| Benzol, etc | 7 | 6 | 7 | 10 | 7 | 6 | 7 | 7 | 6 | 7 | 5 | 5 | 80 | 91 |
| Total production | 259,947 | 244,579 | 268,703 | 260,212 | 267,559 | 258,766 | 268,387 | 270,849 | 257,986 | 267,706 | 260,606 | 268,389 | 3,153,689 | 3,048,985 |
| Imports: [1] | | | | | | | | | | | | | | |
| Crude petroleum | 41,043 | 30,898 | 36,070 | 32,593 | 34,484 | 31,872 | 38,214 | 36,666 | 34,898 | 31,362 | 34,241 | 30,319 | 412,660 | 411,039 |
| Refined products | 43,151 | 33,726 | 29,689 | 32,374 | 26,475 | 22,070 | 26,899 | 25,576 | 24,137 | 32,420 | 27,534 | 38,002 | 362,053 | 348,754 |
| Total new supply | 344,141 | 309,203 | 334,462 | 325,179 | 328,518 | 312,708 | 333,500 | 333,091 | 317,021 | 331,488 | 322,381 | 336,710 | 3,928,402 | 3,808,778 |
| Increase (+) or decrease (−) in stocks | −41,353 | −33,419 | +11,478 | +24,525 | +18,120 | +19,735 | +19,285 | +12,272 | +10,958 | +11,701 | +2,855 | −54,894 | +1,263 | +11,795 |
| Demand: | | | | | | | | | | | | | | |
| Total demand | 385,494 | 342,622 | 322,984 | 300,654 | 310,398 | 292,973 | 314,215 | 320,819 | 306,063 | 319,787 | 319,526 | 391,604 | 3,927,139 | 3,796,983 |
| Exports: [2] | | | | | | | | | | | | | | |
| Crude petroleum | 179 | 116 | 95 | 170 | 140 | 123 | 146 | 178 | 100 | 179 | 106 | 166 | 1,698 | 1,790 |
| Refined products | 4,210 | 8,183 | 5,442 | 6,658 | 6,311 | 5,282 | 5,850 | 6,445 | 7,016 | 5,842 | 6,645 | 6,332 | 74,216 | 59,600 |
| Domestic demand: | | | | | | | | | | | | | | |
| Gasoline | 124,592 | 115,022 | 128,150 | 137,839 | 143,036 | 140,517 | 149,724 | 150,735 | 133,721 | 141,774 | 132,573 | 134,420 | 1,632,103 | 1,584,691 |
| Kerosine | 22,655 | 18,992 | 14,199 | 10,122 | 10,053 | 9,825 | 10,904 | 12,358 | 13,326 | 12,477 | 15,402 | 21,899 | 172,212 | 164,167 |
| Distillate fuel oil | 103,285 | 88,294 | 72,018 | 48,899 | 48,243 | 39,680 | 40,269 | 42,965 | 50,476 | 49,649 | 61,317 | 102,159 | 747,254 | 732,405 |
| Residual fuel oil | 64,447 | 56,088 | 49,255 | 43,280 | 36,982 | 34,958 | 36,223 | 36,083 | 35,908 | 41,561 | 43,789 | 60,350 | 538,924 | 545,813 |
| Military jet fuel | 9,595 | 8,273 | 7,537 | 9,530 | 10,361 | 8,539 | 10,695 | 11,845 | 10,151 | 10,945 | 8,978 | 8,788 | 115,237 | 112,401 |
| Lubricants | 3,773 | 3,061 | 3,359 | 3,817 | 4,108 | 3,806 | 3,734 | 3,960 | 3,438 | 4,333 | 3,324 | 2,888 | 43,601 | 43,615 |
| Wax | 330 | 293 | 363 | 324 | 316 | 297 | 315 | 308 | 320 | 338 | 283 | 322 | 3,809 | 3,965 |
| Coke | 6,325 | 5,283 | 5,996 | 5,592 | 5,753 | 5,751 | 5,976 | 5,655 | 5,566 | 5,728 | 5,145 | 6,553 | 69,323 | 70,704 |
| Asphalt | 3,362 | 2,850 | 4,396 | 5,910 | 14,396 | 13,809 | 16,568 | 16,252 | 14,618 | 14,208 | 6,907 | 4,078 | 117,354 | 114,122 |
| Road oil | 120 | 126 | 158 | 366 | 595 | 1,072 | 1,534 | 1,262 | 812 | 529 | 203 | 137 | 6,914 | 6,965 |
| Still gas | 10,296 | 9,591 | 10,527 | 10,368 | 11,020 | 11,376 | 12,015 | 11,690 | 10,821 | 10,561 | 10,512 | 10,821 | 129,598 | 130,829 |
| Liquefied gases | 28,656 | 23,736 | 18,513 | 15,635 | 15,375 | 15,052 | 17,286 | 17,495 | 16,347 | 17,851 | 21,169 | 29,814 | 236,929 | 255,462 |
| Petrochemical feedstocks [3] | 6,578 | 6,143 | 7,723 | 6,781 | 7,718 | 7,871 | 7,891 | 8,174 | 7,727 | 8,379 | 7,961 | 8,810 | 91,756 | ---------- |
| Miscellaneous | 1,173 | 1,556 | 1,399 | 1,221 | 1,426 | 1,326 | 1,364 | 1,426 | 1,478 | 1,516 | 1,294 | 1,171 | 16,350 | 30,890 |
| Total domestic product demand | 385,187 | 339,308 | 323,593 | 299,684 | 309,382 | 293,879 | 314,498 | 320,208 | 304,709 | 319,849 | 318,857 | 392,210 | 3,921,364 | 3,796,029 |
| Crude losses | 305 | 287 | 299 | 280 | 307 | 295 | 309 | 312 | 290 | 297 | 291 | 299 | 3,571 | 3,465 |
| Less net processing gain | 4,387 | 5,272 | 6,445 | 6,138 | 5,742 | 6,606 | 6,588 | 6,324 | 6,052 | 6,380 | 6,373 | 7,403 | 73,710 | 63,901 |
| Total domestic demand | 381,105 | 334,323 | 317,447 | 293,826 | 303,947 | 287,568 | 308,219 | 314,196 | 298,947 | 313,766 | 312,775 | 385,106 | 3,851,225 | 3,735,593 |
| Stocks: | | | | | | | | | | | | | | |
| Crude petroleum | 249,209 | 240,396 | 241,029 | 251,391 | 255,666 | 250,036 | 249,962 | 249,077 | 248,261 | 245,539 | 244,387 | 237,361 | 237,361 | 252,011 |
| Natural gas liquids | 23,970 | 20,867 | 23,928 | 27,160 | 31,622 | 35,403 | 38,769 | 41,384 | 43,078 | 43,750 | 42,084 | 33,747 | 33,747 | 31,385 |
| Refined products | 519,764 | 498,261 | 506,045 | 516,976 | 526,359 | 547,943 | 563,936 | 574,478 | 584,558 | 598,309 | 603,982 | 564,451 | 564,451 | 550,900 |
| Total stocks | 792,943 | 759,524 | 771,002 | 795,527 | 813,647 | 833,382 | 852,667 | 864,939 | 875,897 | 887,598 | 890,453 | 835,559 | 835,559 | 834,296 |

See footnotes at end of table.

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**TABLE 2.—Supply and demand of all oils in the United States, 1963–64 by months and totals for 1962–64—Continued**

(Thousand barrels)

| | 1964 r | | | | | | | | | | | | 1963 total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | March | April | May | June | July | August | September | October | November | December | Total | |
| New supply: | | | | | | | | | | | | | | |
| Domestic production: | | | | | | | | | | | | | | |
| Crude petroleum | 238,083 | 224,495 | 240,605 | 233,139 | 235,837 | 228,347 | 233,736 | 232,647 | 227,934 | 237,274 | 230,715 | 242,313 | 2,805,125 | 2,752,723 |
| Natural gas liquids | 36,359 | 34,059 | 36,002 | 33,955 | 34,366 | 32,889 | 34,536 | 34,921 | 34,675 | 35,642 | 35,484 | 37,036 | 419,924 | 400,886 |
| Benzol, etc. | 9 | 3 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 1 | 1 | 3 | 29 | 80 |
| Total production | 274,451 | 258,557 | 276,608 | 267,095 | 270,205 | 261,237 | 268,274 | 267,571 | 262,611 | 272,917 | 266,200 | 279,352 | 3,225,078 | 3,153,689 |
| Imports: [1] | | | | | | | | | | | | | | |
| Crude petroleum | 39,635 | 32,209 | 36,945 | 33,091 | 35,968 | 34,387 | 43,820 | 40,743 | 36,853 | 39,224 | 34,102 | 31,666 | 438,643 | 412,660 |
| Refined products | 48,975 | 35,210 | 32,176 | 35,201 | 28,169 | 26,303 | 28,071 | 27,232 | 25,563 | 31,772 | 30,004 | 39,524 | 388,200 | 362,053 |
| Total new supply | 363,061 | 325,976 | 345,729 | 335,387 | 334,342 | 321,927 | 340,165 | 335,546 | 325,027 | 343,913 | 330,306 | 350,542 | 4,051,921 | 3,928,402 |
| Increase (+) or decrease (−) in stocks. | −22,770 | −9,902 | +6,362 | +8,797 | +24,676 | +1,137 | +12,857 | +16,566 | +3,185 | +1,773 | +4,231 | −43,236 | +3,676 | +1,263 |
| Demand: | | | | | | | | | | | | | | |
| Total demand | 385,831 | 335,878 | 339,367 | 326,590 | 309,666 | 320,790 | 327,308 | 318,980 | 321,842 | 342,140 | 326,075 | 393,778 | 4,048,245 | 3,927,139 |
| Exports: [2] | | | | | | | | | | | | | | |
| Crude petroleum | 116 | 98 | 233 | 100 | 174 | 152 | 90 | 118 | 71 | 88 | | 123 | 1,363 | 1,698 |
| Refined products | 6,677 | 4,753 | 6,012 | 6,400 | 5,711 | 6,442 | 6,669 | 6,026 | 5,592 | 6,485 | 5,403 | 6,235 | 72,405 | 74,216 |
| Domestic demand: | | | | | | | | | | | | | | |
| Gasoline | 130,511 | 121,819 | 135,523 | 140,622 | 144,860 | 153,486 | 156,720 | 150,125 | 145,620 | 147,760 | 131,528 | 145,540 | 1,704,114 | 1,632,103 |
| Kerosine | 21,199 | 17,658 | 15,155 | 12,628 | 11,054 | 10,284 | 12,280 | 12,821 | 13,671 | 15,806 | 15,119 | 20,734 | 178,409 | 172,212 |
| Distillate fuel oil | 96,053 | 81,538 | 73,397 | 59,579 | 46,844 | 43,825 | 41,177 | 41,350 | 48,077 | 56,790 | 65,858 | 94,518 | 749,006 | 747,254 |
| Residual fuel oil | 66,431 | 53,373 | 49,740 | 48,187 | 37,546 | 35,704 | 38,167 | 36,660 | 38,323 | 45,065 | 45,653 | 61,209 | 556,058 | 538,924 |
| Military jet fuel | 9,727 | 8,354 | 9,452 | 10,281 | 10,448 | 11,859 | 10,299 | 10,730 | 10,648 | 9,756 | 9,696 | 7,331 | 118,581 | 115,237 |
| Lubricants | 3,982 | 3,355 | 3,775 | 4,390 | 3,603 | 4,314 | 3,968 | 3,722 | 3,924 | 3,740 | 3,589 | 3,442 | 45,804 | 43,601 |
| Wax | 314 | 255 | 339 | 321 | 289 | 288 | 308 | 281 | 311 | 323 | 315 | 252 | 3,596 | 3,809 |
| Coke | 5,789 | 5,724 | 6,284 | 5,557 | 5,446 | 6,001 | 5,952 | 6,247 | 5,955 | 5,948 | 5,546 | 6,001 | 70,450 | 69,323 |
| Asphalt | 3,276 | 3,327 | 4,349 | 7,135 | 11,934 | 15,524 | 16,702 | 16,656 | 15,532 | 13,895 | 7,923 | 3,894 | 120,147 | 117,354 |
| Road oil | 59 | 65 | 83 | 183 | 617 | 1,033 | 1,578 | 1,075 | 751 | 655 | 323 | 123 | 6,545 | 6,914 |
| Still gas | 10,617 | 9,942 | 10,820 | 10,618 | 11,212 | 11,654 | 12,208 | 11,479 | 10,935 | 10,539 | 10,438 | 10,795 | 131,257 | 129,598 |
| Liquefied gases | 27,770 | 22,165 | 19,896 | 16,857 | 15,809 | 15,697 | 17,626 | 18,597 | 18,779 | 20,894 | 21,944 | 28,970 | 245,004 | 236,929 |
| Petrochemical feedstocks [3] | 8,750 | 8,104 | 9,045 | 8,811 | 8,765 | 9,036 | 8,999 | 8,442 | 8,597 | 9,036 | 8,248 | 8,956 | 104,789 | 91,756 |
| Miscellaneous | 1,540 | 1,349 | 1,269 | 1,399 | 1,253 | 1,573 | 1,402 | 1,256 | 1,294 | 1,422 | 1,339 | 1,354 | 16,450 | 16,350 |

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| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total domestic product demand | 366,018 | 337,028 | 339,127 | 326,569 | 300,680 | 320,278 | 327,386 | 319,441 | 322,417 | 341,629 | 327,619 | 303,119 | 4,060,210 | 3,921,864 |
| Crude losses | 303 | 287 | 300 | 288 | 298 | 298 | 312 | 311 | 299 | 303 | 293 | 310 | 3,602 | 3,671 |
| Less net processing gain | 7,283 | 6,288 | 6,305 | 6,709 | 6,197 | 6,380 | 7,149 | 6,916 | 6,537 | 6,365 | 7,140 | 6,009 | 76,335 | 72,710 |
| Total domestic demand | 379,038 | 331,027 | 333,122 | 320,090 | 303,781 | 314,196 | 320,549 | 312,836 | 316,179 | 335,667 | 320,672 | 387,420 | 3,974,477 | 3,851,225 |
| Stocks: | | | | | | | | | | | | | | |
| Crude petroleum | 241,007 | 240,062 | 246,863 | 253,912 | 257,822 | 251,220 | 246,333 | 237,912 | 232,780 | 235,233 | 236,809 | 230,057 | 230,057 | 237,361 |
| Natural gas liquids | 28,435 | 27,389 | 29,901 | 34,128 | 38,925 | 42,527 | 46,030 | 46,631 | 46,792 | 46,133 | 43,236 | 35,679 | 35,679 | 33,747 |
| Refined products | 543,347 | 535,436 | 532,485 | 530,006 | 546,475 | 550,102 | 565,344 | 588,739 | 596,895 | 596,874 | 602,426 | 573,499 | 573,499 | 564,451 |
| Total stocks | 812,789 | 802,887 | 809,249 | 818,046 | 842,722 | 843,859 | 856,716 | 873,282 | 876,467 | 878,240 | 882,471 | 839,235 | 839,235 | 835,559 |

[1] Preliminary.
[2] Bureau of Mines data for crude oil and unfinished oils, U.S. Department of Commerce data for all other imports.
[3] U.S. Department of Commerce data.
[4] Produced at petroleum refineries.

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**Gasoline.**—The total demand for gasoline, which includes motor gasoline, aviation gasoline, and naphthas, was 1,712,056,000 barrels in 1964, compared with 1,639,089,000 barrels in 1963. Domestic demand was 1,704,114,000 barrels, an increase of 4.4 percent for the year, and exports totaled 7,942,000 barrels, a gain of 13.6 percent. The demand for aviation gasoline continued to decline and for the year was 53,283,000 barrels, 1,517,000 barrels less than in 1963. A breakdown of domestic demand by use indicates that in 1964 civilian highway use accounted for 89.8 percent; aviation gasoline, 2.8 percent; and nonhighway vehicles, nonfuel use, and losses, 7.4 percent.

**Distillate Fuel Oil.**—The total demand for distillate fuel oil in 1964 was 754,440,000 barrels, a decrease of 1.0 percent. This included a domestic demand of 749,006,000 barrels and exports of 5,434,000 barrels.

**Residual Fuel Oil.**—The demand for residual fuel oil (574,928,000 barrels) was noticeably higher than in 1963. With domestic demand up 17.1 million barrels and exports up 3.6 million barrels, the total demand was 20.7 million barrels greater in 1964 than in 1963.

**Kerosine.**—Commercial jet aircraft use of kerosine as fuel continued to increase in 1964 and accounted for 85,672,000 barrels or 48 percent of the total domestic demand. Other uses for kerosine declined 4.4 percent for the year.

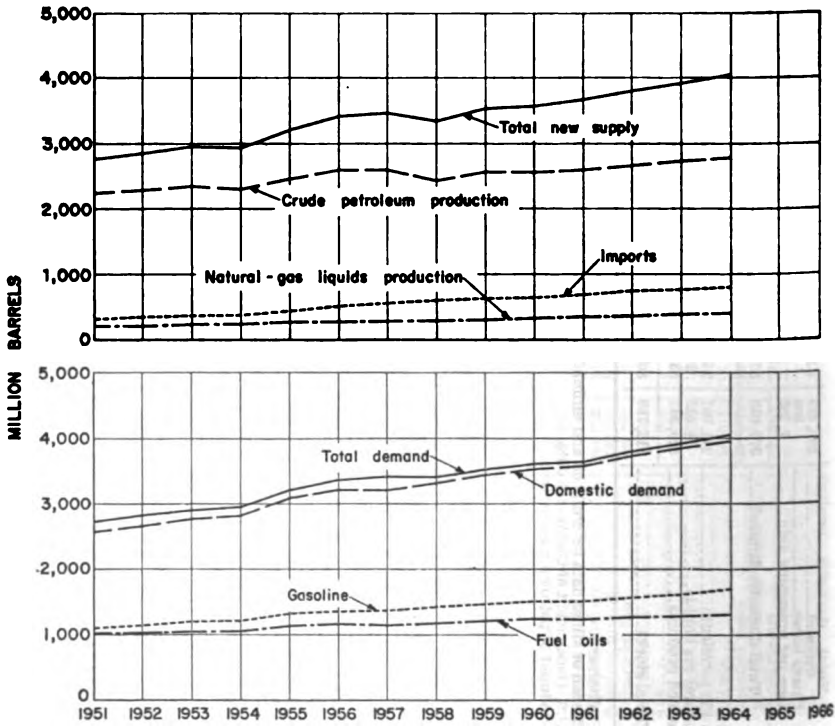


FIGURE 1.—Supply and demand of all oils in the United States, 1951–64.

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TABLE 3.—Demand for all oils[1] in the United States, 1955–64

(Million barrels)

| Year | Domestic demand | Exports | Total demand | Year | Domestic demand | Exports | Total demand |
|---|---|---|---|---|---|---|---|
| 1955 | 3,067.8 | 134.2 | 3,222.0 | 1960 | 3,535.8 | 73.9 | 3,609.7 |
| 1956 | 3,213.2 | 157.4 | 3,370.6 | 1961 | 3,579.2 | 63.6 | 3,642.8 |
| 1957 | 3,218.6 | 207.2 | 3,425.8 | 1962 | 3,735.6 | 61.4 | 3,797.0 |
| 1958 | 3,315.2 | 100.6 | 3,415.8 | 1963 | 3,851.2 | 75.9 | 3,927.1 |
| 1959 | 3,449.6 | 77.1 | 3,526.7 | 1964 p | 3,974.5 | 73.7 | 4,048.2 |

p Preliminary.
[1] See text footnote 3 at the beginning of this chapter.

**Other Products.**—The total demand for all other products, including crude oil exports and losses as well as refinery overage, was 828,241,000 barrels in 1964, a gain of 3.7 percent. The 1964 demand for petrochemical feedstocks was 104,789,000 barrels, of which 7,698,000 barrels was produced from still gas, 47,190,000 barrels from liquefied refinery gas, 24,583,000 barrels from naphtha, and 25,318,000 barrels from the other products which are principally miscellaneous finished products, but which also include kerosine, distillate fuel oils, and residual fuel oil. The total demand for military-grade jet fuel increased 2.9 percent in 1964; asphalt demand increased 2.4 percent; petroleum coke, 4.9 percent; lubricating oils, 3.3 percent; and wax 1.3 percent. Demand for road oil declined 5.3 percent.

**Shipments to U.S. Territories and Possessions.**—Domestic demand, as defined in this chapter, refers to demand in all States of the United States. Shipments from the United States to territories and possessions are included with exports. Any foreign receipts into these territories and possessions are not included in the total imports shown.

Shipments from territories and possessions to foreign countries are excluded from total exports. Shipments to the United States are included in imports.

## SCOPE OF REPORT

This report deals primarily with statistics for production, refining, distribution, and indicated consumption of crude petroleum and refined products in the United States; it also contains a brief description of technological developments. The object of limiting data to the United States is to permit a breakdown and balancing of supply and demand of operations by States and districts. The composition of the districts used by the Bureau of Mines is explained in the next section.

The increasing volume of natural gas liquids recovered from natural gas has made it desirable to present data on these liquids with crude oil data, as these liquids are blended with refinery products and are similar to materials recovered from refinery gases. These natural gas liquids are recovered at natural-gas processing plants, away from the oil refineries.

Most of the data were compiled by the Bureau of Mines from detailed reports, submitted on a voluntary basis by the various companies. These data are published monthly for release about 8 weeks

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after the end of the month. Complete coverage, with only minor estimates, is procured for production, stocks, and refinery operations. The Bureau of Mines uses the import data on crude oil and unfinished oils as reported by the refineries. Other product imports and all export data are taken from records of the U.S. Department of Commerce.

The Bureau of Mines uses crude-oil production data compiled by State agencies for those States which compile the information. Where such data are not available, the Bureau of Mines sends monthly questionnaires to all pipeline companies operating within the State. Monthly reports are received from refineries showing crude oil receipts by States of origin and method of transportation. These reports include information covering final receipts by water, tank-cars, and trucks and cover stocks of crude oil held at refineries, by State of origin. The Bureau of Mines crude production figure includes field condensate.

Individual refineries reported monthly receipts, input, stocks at the beginning and end of the month, refinery production, and deliveries. Data on both product stocks at refineries and pipeline and bulk terminal stocks are collected.

Semiannual canvasses of refineries, pipeline companies, and natural gas liquids plants provide data on storage tank capacities assigned to the various refined products and to liquefied gases at plants, terminals, and underground storage facilities.

Annual canvasses provide supplemental information on the value of crude petroleum at wells, the number of producing wells, sales of fuel oils, asphalt and road oils by uses, and refinery capacity.

The table showing world production of crude oil by countries is based on monthly reports that also included data on crude movements and refinery operations. Data on crude reserves, wells drilled, and current prices were taken from the sources indicated in the footnotes.

The 1964 Minerals Yearbook is the first one which gives final figures on production and value of crude petroleum and average value per barrel. Final figures are shown in tables 7, 8, 9, 17, 18 and 24. The production figures used in all other tables are preliminary, as they have been in the past.

### DISTRICTS

The Bureau of Mines reported production of crude petroleum and natural gas liquids and the number of wells drilled by States. Louisiana, New Mexico, and Texas were also reported by districts.

New Mexico has two widely separated producing areas. The Southeastern district comprises mainly Lea, Eddy, Chaves, and Roosevelt Counties. The Northwestern district comprises mainly San Juan, Rio Arriba, Sandoval, and McKinley Counties.

The Bureau of Mines producing districts in Texas correspond, with one exception, to grouping of the Texas Railroad Commission districts.

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| Bureau of Mines districts: | *Railroad Commission districts* |
|---|---|
| Gulf Coast | Nos. 2 and 3 |
| West Texas | Nos. 7C and 8 |
| East Proper | Part of No. 6 (East Texas field in Cherokee, Smith, Upshur, Rusk, and Gregg Counties) |
| Panhandle | No. 10 |
| Rest of State: | |
| North | Nos. 7B and 9 |
| Central | No. 1 |
| South | No. 4 |
| Other East Texas | Nos. 5 and 6 (exclusive of East Proper) |

The Bureau of Mines groups refinery operations into another set of districts called refining districts. These refining districts correspond with the grouping originated by the Petroleum Administration for War during World War II and called PAW districts (later changed to PAD districts).

| PAD district | *Refining district* |
|---|---|
| 1 | *East Coast*—Districts of Columbia and Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida, and the following counties of New York: Cayuga, Tompkins, Chemung, and all counties east and north thereof, and the following counties of Pennsylvania: Bradford, Sullivan, Columbia, Montour, Northumberland, Dauphin, York, and all counties east thereof. |
| 1 | *Appalachian No. 1*—West Virginia and those parts of Pennsylvania and New York not included in the East Coast district. |
| 2 | *Appalachian No. 2*—The following counties of Ohio: Erie, Huron, Crawford, Marion, Delaware, Franklin, Pickaway, Ross, Pike, Scioto, and all counties east thereof. |
| 2 | *Indiana-Illinois-Kentucky*—Indiana, Illinois, Kentucky, Tennessee, Michigan, and that part of Ohio not included in the Appalachian district. |
| 2 | *Oklahoma-Kansas-Missouri*—Oklahoma, Kansas, Missouri, Nebraska, and Iowa. |
| 2 | *Minnesota-Wisconsin-North Dakota-South Dakota*—Minnesota, Wisconsin, North Dakota, and South Dakota. |
| 3 | *Texas Inland*—Texas, except Texas Gulf Coast district. |
| 3 | *Texas Gulf Coast*—The following counties of Texas: Newton, Orange, Jefferson, Jasper, Tyler, Hardin, Liberty, Chambers, Polk, San Jacinto, Montgomery, Harris, Galveston, Waller, Fort Bend, Brazoria, Wharton, Matagorda, Jackson, Victoria, Calhoun, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron. |
| 3 | *Louisiana Gulf Coast*—The following parishes of Louisiana: Vernon, Rapides, Avoyelles, Pointe Coupee, West Feliciana, East Feliciana, Tangipahoa, St. Helena, Washington, and all parishes south thereof; the following counties of Mississippi: Pearl River, Stone, George, Hancock, Harrison, and Jackson; and Mobile and Baldwin Counties, Ala. |
| 3 | *North Louisiana-Arkansas*—Arkansas and those parts of Louisiana, Mississippi and Alabama not included in the Louisiana Gulf Coast district. |
| 3 | *New Mexico*—New Mexico. |
| 4 | *Rocky Mountain*—Montana, Idaho, Wyoming, Utah, and Colorado. |
| 5 | *West Coast*—Washington, Oregon, California, Nevada, Alaska, Arizona, and Hawaii. |

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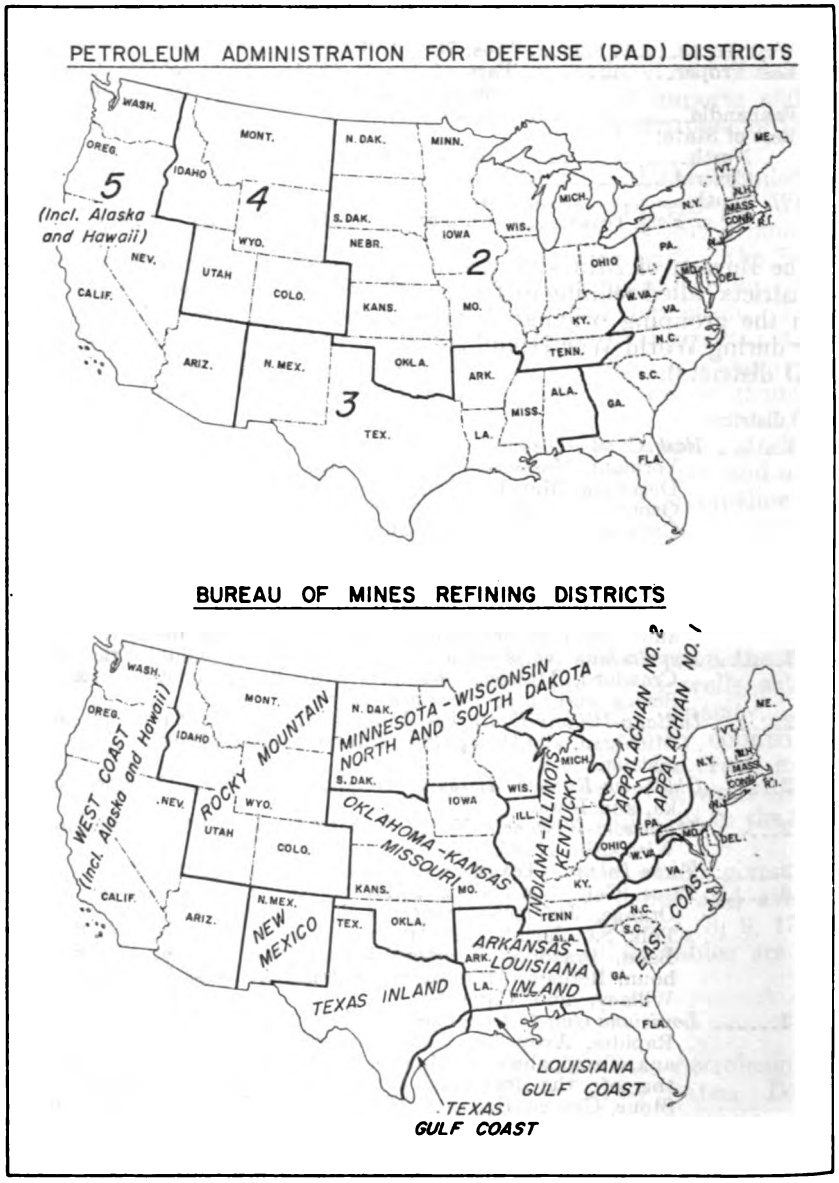


FIGURE 2.—Map of PAD districts and Bureau of Mines refining districts.

## WORLD OIL SUPPLY

Crude oil production for the world in 1964 was 10,328 million barrels, compared with 9,537 million barrels in 1963. U.S. production represented 27.0 percent of the world total, less than in 1963.

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## RESERVES

The American Petroleum Institute Committee on Petroleum Reserves estimated proved reserves of crude oil in the United States to be 30,990,510,000 barrels on December 31, 1964, an increase of 20,520,000 barrels for the year.

The estimates of crude-oil reserves include only oil recoverable under existing economic and operating conditions.

**TABLE 4.—Estimates of proved crude-oil reserves in the United States on Dec. 31, by States[1]**

(Million barrels)

| State | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|
| Eastern States: | | | | | | | | |
| Illinois | 655 | 608 | 594 | 556 | 503 | 460 | 417 | 391 |
| Indiana | 67 | 71 | 74 | 66 | 62 | 61 | 63 | 61 |
| Kentucky | 133 | 126 | 136 | 129 | 116 | 109 | 100 | 118 |
| Michigan | 49 | 45 | 55 | 78 | 79 | 75 | 69 | 58 |
| New York | 37 | 36 | 34 | 32 | 28 | 23 | 18 | 14 |
| Ohio | 68 | 71 | 74 | 75 | 76 | 77 | 88 | 100 |
| Pennsylvania | 126 | 120 | 114 | 108 | 102 | 97 | 92 | 87 |
| West Virginia | 53 | 52 | 51 | 51 | 51 | 56 | 57 | 59 |
| Total | 1,193 | 1,129 | 1,132 | 1,095 | 1,017 | 958 | 904 | 888 |
| Central and Southern States: | | | | | | | | |
| Arkansas | 305 | 318 | 313 | 302 | 281 | 247 | 225 | 205 |
| Kansas | 947 | 922 | 917 | 884 | 878 | 862 | 841 | 797 |
| Louisiana[2] | 3,858 | 4,044 | 4,660 | 4,785 | 4,931 | 5,087 | 5,089 | 5,162 |
| Mississippi | 360 | 379 | 389 | 407 | 401 | 388 | 385 | 357 |
| Nebraska | 63 | 69 | 81 | 86 | 100 | 94 | 84 | 71 |
| New Mexico | 832 | 894 | 1,026 | 1,084 | 1,090 | 1,065 | 1,011 | 967 |
| North Dakota | 258 | 314 | 382 | 431 | 413 | 404 | 389 | 377 |
| Oklahoma | 1,941 | 1,898 | 1,865 | 1,791 | 1,787 | 1,728 | 1,586 | 1,586 |
| Texas[2] | 14,555 | 14,322 | 14,860 | 14,758 | 14,850 | 14,648 | 14,573 | 14,300 |
| Total | 23,119 | 23,160 | 24,493 | 24,528 | 24,731 | 24,523 | 24,225 | 23,812 |
| Mountain States: | | | | | | | | |
| Colorado | 310 | 392 | 381 | 364 | 420 | 388 | 368 | 346 |
| Montana | 320 | 338 | 309 | 267 | 251 | 249 | 271 | 252 |
| Utah | 140 | 199 | 195 | 208 | 218 | 198 | 220 | 219 |
| Wyoming | 1,420 | 1,409 | 1,403 | 1,427 | 1,381 | 1,297 | 1,254 | 1,204 |
| Total | 2,190 | 2,338 | 2,288 | 2,266 | 2,270 | 2,132 | 2,113 | 2,021 |
| Pacific Coast States: California[2] | 3,760 | 3,866 | 3,763 | 3,659 | 3,615 | 3,648 | 3,600 | 4,125 |
| Other States[3] | 38 | 43 | 43 | 65 | 126 | 128 | 128 | 145 |
| Total United States | 30,300 | 30,536 | 31,719 | 31,613 | 31,759 | 31,389 | 30,970 | 30,991 |

[1] From reports of Committee on Petroleum Reserves, American Petroleum Institute. Includes crude oil that may be extracted by present methods from fields completely developed or sufficiently explored to permit reasonably accurate calculations. The change in reserves during any year represents total new discoveries, extentions, and revisions, minus production.

[2] Includes offshore reserves.

[3] Includes Alabama, Arizona, Florida, Missouri, Nevada, South Dakota, Tennessee, Virginia, Washington 1957-60, and Alaska 1959-64.

## CRUDE PETROLEUM

### SUPPLY AND DEMAND

The new supply of crude petroleum was derived primarily from domestic production, but the supply was augmented by imports. Crude imports represented 13.5 percent of the crude supply in 1964, compared with 13.0 percent in 1963. Under the mandatory import control program, which became effective in March 1959, imports of

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crude oil, unfinished oils, and refined products other than residual fuel oil are limited to 12.2 percent of the estimated total production of crude oil and natural gas liquids in all States east of the Rocky Mountains. In States west of the Rocky Mountains, including Alaska and Hawaii, the import quota is based on the difference between the estimated available domestic supply and the estimated total demand. Overland receipts (imports from Canada and Mexico) are exempted from provisions of the program; however, before setting the allocations for crude and unfinished oils, an estimate of probable receipts by pipeline from Canada and overland from Mexico are subtracted from the amounts to be allocated. Vessel and aircraft fuels imported in bond for use as fuel outside the United States are also exempted from provisions of the program. All refineries of record are granted an allocation based on their refinery throughput with certain special provisions applying to refineries that imported crude oil during 1957, the base year for the program.

## PRODUCTION

### GENERAL

Crude oil production in the United States averaged 7,664,000 barrels daily in 1964 compared with 7,542,000 barrels daily in 1963. The demand for domestic crude oil exceeded production, resulting in a 7 million barrel reduction in stocks of domestic crude oil.

### BY STATES

Additional data on production by States will be found in volume III of the 1964 Minerals Yearbook.

**TABLE 5.—Supply and demand [1] for crude petroleum in the United States**

(Thousand barrels)

| | 1960 | 1961 | 1962 | 1963 | [p] 1964 |
|---|---|---|---|---|---|
| Production | 2,574,933 | 2,621,758 | 2,676,189 | 2,752,723 | 2,805,125 |
| Imports [2] | 371,575 | 381,548 | 411,039 | 412,660 | 438,643 |
| Total new supply | 2,946,508 | 3,003,306 | 3,087,228 | 3,165,383 | 3,243,768 |
| Increase (+) or decrease (−) in stocks, end of year | −17,329 | +4,864 | +7,347 | −14,650 | −7,304 |
| Demand: | | | | | |
| Domestic crude | 2,592,289 | 2,614,919 | 2,669,398 | 2,767,129 | 2,813,433 |
| Foreign crude | 371,548 | 383,523 | 410,483 | 412,904 | 437,639 |
| Total demand | 2,963,837 | 2,998,442 | 3,079,881 | 3,180,033 | 3,251,072 |
| Runs to stills: | | | | | |
| Domestic | 2,581,568 | 2,604,127 | 2,659,826 | 2,758,168 | 2,804,198 |
| Foreign | 370,966 | 383,031 | 409,805 | 412,484 | 437,434 |
| Exports [3] | 3,087 | 3,227 | 1,790 | 1,698 | 1,363 |
| Transfers to fuel oil: | | | | | |
| Distillate | 1,001 | 851 | 1,198 | 807 | 755 |
| Residual | 3,948 | 3,854 | 3,797 | 3,305 | 3,720 |
| Other fuel losses | 3,267 | 3,352 | 3,465 | 3,571 | 3,602 |
| Total demand | 2,963,837 | 2,998,442 | 3,079,881 | 3,180,033 | 3,251,072 |

[p] Preliminary.
[1] For definition see footnote at the beginning of this chapter.
[2] Bureau of Mines data.
[3] U.S. Department of Commerce data.

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**TABLE 6.—Supply of and demand for crude petroleum in the United States, by months**

(Thousand barrels)

| | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| Supply: | | | | | | | | | | | | | |
| Production | 226,420 | 212,437 | 234,289 | 228,270 | 234,499 | 226,853 | 235,144 | 236,830 | 225,207 | 233,610 | 226,321 | 232,843 | 2,752,723 |
| Imports [1] | 41,043 | 30,898 | 36,070 | 32,593 | 34,484 | 31,872 | 38,214 | 36,666 | 34,898 | 31,362 | 34,241 | 30,319 | 412,660 |
| Total new supply | 267,463 | 243,335 | 270,359 | 260,863 | 268,983 | 258,725 | 273,358 | 273,496 | 260,105 | 264,972 | 260,562 | 263,162 | 3,165,383 |
| Change in stocks, end of period: | | | | | | | | | | | | | |
| Domestic | −6,902 | −6,061 | −727 | +8,580 | +4,084 | −2,897 | −1,554 | −2,106 | −2,025 | −996 | −2,349 | −1,453 | −14,406 |
| Foreign | +4,100 | −2,752 | +1,360 | +1,782 | +191 | −2,733 | +1,480 | +1,221 | +1,209 | −1,726 | +1,197 | −5,573 | −244 |
| Demand: | | | | | | | | | | | | | |
| Domestic | 233,322 | 218,498 | 235,016 | 219,690 | 230,415 | 229,750 | 236,698 | 238,936 | 227,232 | 234,606 | 228,670 | 234,296 | 2,767,129 |
| Foreign | 36,943 | 33,650 | 34,710 | 30,811 | 34,293 | 34,605 | 36,734 | 35,445 | 33,689 | 33,088 | 33,044 | 35,892 | 412,904 |
| Runs to stills: | | | | | | | | | | | | | |
| Domestic | 232,556 | 217,809 | 234,284 | 218,924 | 229,689 | 228,972 | 235,973 | 238,086 | 226,561 | 233,903 | 227,991 | 233,420 | 2,758,168 |
| Foreign | 36,882 | 33,613 | 34,708 | 30,792 | 34,247 | 34,617 | 36,691 | 35,446 | 33,645 | 32,981 | 33,010 | 35,852 | 412,484 |
| Exports [2] | 179 | 116 | 95 | 170 | 140 | 123 | 146 | 178 | 100 | 179 | 106 | 166 | 1,698 |
| Transfers: | | | | | | | | | | | | | |
| Distillate | 77 | 72 | 94 | 66 | 61 | 63 | 62 | 64 | 61 | 61 | 57 | 69 | 807 |
| Residual | 266 | 251 | 246 | 269 | 264 | 285 | 251 | 295 | 264 | 273 | 259 | 382 | 3,305 |
| Losses | 305 | 287 | 299 | 280 | 307 | 295 | 309 | 312 | 290 | 297 | 291 | 299 | 3,571 |
| 1964: [p] | | | | | | | | | | | | | |
| Supply: | | | | | | | | | | | | | |
| Production | 238,083 | 224,495 | 240,605 | 233,139 | 235,837 | 228,347 | 233,736 | 232,647 | 227,934 | 237,274 | 230,715 | 242,313 | 2,805,125 |
| Imports [1] | 39,635 | 32,209 | 36,945 | 33,091 | 35,968 | 34,387 | 43,820 | 40,743 | 36,853 | 39,224 | 34,102 | 31,666 | 438,643 |
| Total new supply | 277,718 | 256,704 | 277,550 | 266,230 | 271,805 | 262,734 | 277,556 | 273,390 | 264,787 | 276,498 | 264,817 | 273,979 | 3,243,768 |
| Change in stocks, end of period: | | | | | | | | | | | | | |
| Domestic | −332 | −43 | +3,892 | +7,447 | +2,036 | −1,607 | −8,257 | −9,066 | −3,992 | +1,922 | +2,187 | −2,495 | −8,308 |
| Foreign | +3,978 | −902 | +2,909 | −398 | +1,374 | −4,485 | +3,360 | +645 | −1,140 | +531 | −611 | −4,257 | +1,004 |
| Demand: | | | | | | | | | | | | | |
| Domestic | 238,415 | 224,538 | 236,713 | 225,692 | 233,801 | 229,954 | 241,993 | 241,713 | 231,926 | 235,352 | 228,528 | 244,808 | 2,813,433 |
| Foreign | 35,657 | 33,111 | 34,036 | 33,489 | 34,594 | 38,872 | 40,460 | 40,098 | 37,993 | 38,693 | 34,713 | 35,923 | 437,639 |
| Runs to stills: | | | | | | | | | | | | | |
| Domestic | 237,753 | 223,712 | 235,897 | 224,842 | 232,910 | 229,206 | 241,291 | 240,936 | 231,157 | 234,646 | 227,939 | 243,909 | 2,804,198 |
| Foreign | 35,586 | 33,120 | 33,996 | 33,527 | 34,675 | 38,832 | 40,427 | 40,071 | 37,969 | 38,689 | 34,661 | 35,881 | 437,434 |
| Exports [2] | 116 | 98 | 233 | 100 | 174 | 152 | 90 | 118 | 71 | 88 | ---------- | 123 | 1,363 |
| Transfers: | | | | | | | | | | | | | |
| Distillate | 68 | 60 | 87 | 61 | 53 | 62 | 63 | 62 | 58 | 58 | 62 | 61 | 755 |
| Residual | 246 | 372 | 236 | 363 | 285 | 276 | 270 | 313 | 365 | 261 | 286 | 447 | 3,720 |
| Losses | 303 | 287 | 300 | 288 | 298 | 298 | 312 | 311 | 299 | 303 | 293 | 310 | 3,602 |

[p] Preliminary. [1] Bureau of Mines data. [2] U.S. Department of Commerce.

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## TABLE 7.—Petroleum produced in the United States by States [1]

(Thousand barrels unless otherwise stated)

| | 1960 | 1961 | 1962 | 1963 | 1964 | 1859–1964 total |
|---|---|---|---|---|---|---|
| Production: | | | | | | |
| Alabama | 7,329 | 6,931 | 7,473 | 9,175 | 8,498 | 68,943 |
| Alaska | 559 | 6,327 | 10,259 | 10,740 | 11,059 | 39,131 |
| Arkansas | 30,117 | 29,246 | 27,649 | 27,406 | 26,737 | 1,199,106 |
| California | 305,352 | 299,609 | 296,590 | 300,908 | 300,009 | 13,224,857 |
| Colorado | 47,469 | 46,759 | 42,477 | 38,283 | 34,755 | 758,876 |
| Florida | 369 | 374 | 419 | 464 | 620 | 8,412 |
| Illinois | 77,341 | 76,818 | 78,796 | 74,796 | 70,168 | 2,528,245 |
| Indiana | 12,054 | 11,500 | 12,077 | 11,902 | 11,283 | 385,284 |
| Kansas | 113,453 | 112,241 | 112,076 | 109,107 | 106,252 | [2] 3,751,191 |
| Kentucky | 21,147 | 18,344 | 17,789 | 18,344 | 19,772 | [3] 491,447 |
| Louisiana | 400,832 | 424,962 | 477,153 | 515,057 | 549,689 | 7,485,002 |
| Michigan | 15,899 | 18,901 | 17,114 | 15,972 | 15,601 | [4] 509,147 |
| Mississippi | 51,673 | 54,688 | 55,713 | 58,619 | 56,777 | 911,357 |
| Montana | 30,240 | 30,906 | 31,648 | 30,870 | 30,647 | 489,641 |
| Nebraska | 23,825 | 24,369 | 24,894 | 21,846 | 19,113 | 231,023 |
| Nevada | 27 | 154 | 141 | 118 | 255 | 972 |
| New Mexico | 107,380 | 112,553 | 109,328 | 109,941 | 113,863 | [5] 1,961,938 |
| New York | 1,813 | 1,658 | 1,589 | 1,679 | 1,874 | [6] 202,829 |
| North Dakota | 21,992 | 23,652 | 25,181 | 25,030 | 25,731 | 204,348 |
| Ohio | 5,405 | 5,639 | 5,835 | 6,039 | 15,859 | 700,610 |
| Oklahoma | 192,913 | 193,081 | 202,732 | 201,962 | 202,524 | [7] 9,026,175 |
| Pennsylvania | 6,009 | 5,643 | 5,302 | 5,083 | 5,113 | [6] 1,242,629 |
| Texas | 927,479 | 939,191 | 943,328 | 977,835 | 989,525 | 27,673,181 |
| Utah | 37,594 | 33,118 | 31,029 | 33,435 | 28,575 | [7] 246,216 |
| West Virginia | 2,300 | 2,760 | 3,470 | 3,350 | 3,370 | 478,593 |
| Wyoming | 133,910 | 141,937 | 135,847 | 144,407 | 138,752 | 2,479,324 |
| Other States [8] | 452 | 397 | 280 | 255 | 392 | 4,842 |
| Total | 2,574,933 | 2,621,758 | 2,676,189 | 2,752,723 | 2,786,822 | 76,283,319 |
| Value at wells: | | | | | | |
| Total (thousand dollars) | 7,420,181 | 7,565,582 | 7,774,051 | 7,965,743 | 8,017,078 | 158,360,871 |
| Average per barrel | $2.88 | $2.89 | $2.90 | $2.89 | $2.88 | $2.08 |

[1] For detailed figures by States, 1859–1935, see 1937 Minerals Yearbook, p. 1008.
[2] Oklahoma included with Kansas in 1905 and 1906.
[3] Includes Tennessee, 1883–1907.
[4] Figures represent 1925–64 production only; earlier years included with "Other States".
[5] Figures represent 1924–64 production only; earlier years included with "Other States".
[6] Earlier production in New York included with Pennsylvania.
[7] Figures represent 1946–64 production only; earlier years included with "Other States".
[8] Includes Alaska, 1912–33; Arizona, 1958–64; Arkansas, 1920; Michigan, 1900–1919; Mississippi, 1933–35; Missouri, 1899–1911, 1913–16; 1919–23, 1932–64; New Mexico, 1913, 1919–23; South Dakota, 1955–64; Tennessee, 1916–64; Utah, 1907–11, 1920, 1924–41; Virginia, 1943–64; Washington, 1958–60.

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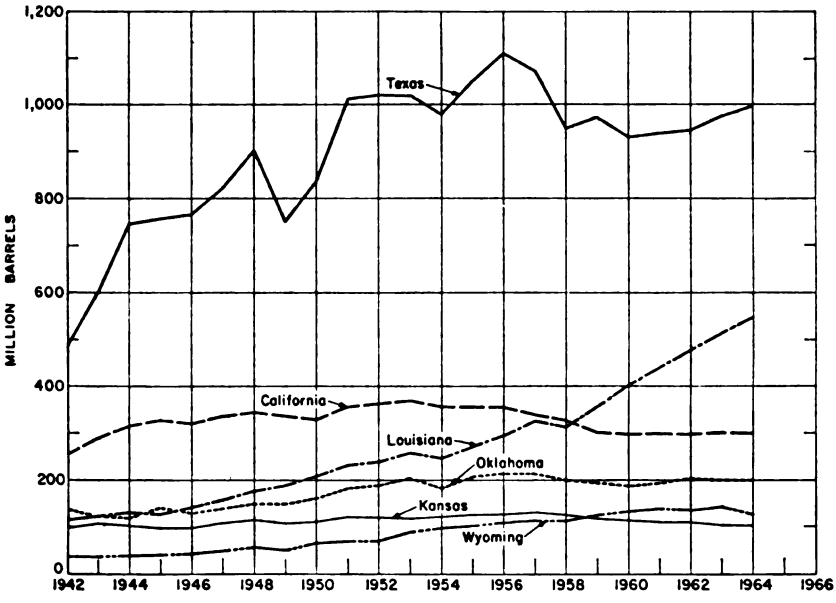


FIGURE 3.—Production of crude petroleum in the United States, 1942–64, by principal producing States.

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**TABLE 8.—Production of crude petroleum in the United States in 1963–64, by States and months [1]**

(Thousand barrels)

| State | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963, final figures: | | | | | | | | | | | | | |
| Alabama | 807 | 748 | 813 | 774 | 702 | 787 | 725 | 768 | 787 | 787 | 736 | 741 | 9,175 |
| Alaska | 944 | 813 | 894 | 863 | 892 | 867 | 907 | 896 | 889 | 945 | 903 | 927 | 10,740 |
| Arkansas | 2,252 | 2,121 | 2,315 | 2,238 | 2,330 | 2,252 | 2,334 | 2,391 | 2,298 | 2,355 | 2,265 | 2,255 | 27,406 |
| California [2] | 25,276 | 22,869 | 25,577 | 24,975 | 25,577 | 24,976 | 25,577 | 25,577 | 24,976 | 25,577 | 24,675 | 25,276 | 300,908 |
| Colorado [3] | 3,369 | 3,139 | 3,407 | 3,254 | 3,254 | 3,177 | 3,217 | 3,139 | 3,025 | 3,177 | 2,986 | 3,139 | 38,283 |
| Florida | 33 | 32 | 44 | 39 | 42 | 41 | 39 | 40 | 36 | 40 | 39 | 39 | 464 |
| Illinois | 6,257 | 5,812 | 6,346 | 6,384 | 6,439 | 6,087 | 6,540 | 6,406 | 6,087 | 6,384 | 5,991 | 6,063 | 74,796 |
| Indiana | 976 | 944 | 1,012 | 1,031 | 990 | 1,031 | 1,062 | 992 | 1,019 | 1,052 | 859 | 934 | 11,902 |
| Kansas [4] | 8,707 | 8,765 | 9,386 | 9,253 | 9,163 | 8,993 | 9,342 | 9,239 | 8,939 | 9,371 | 8,890 | 9,059 | 109,107 |
| Kentucky | 1,431 | 1,394 | 1,504 | 1,559 | 1,596 | 1,523 | 1,633 | 1,559 | 1,541 | 1,596 | 1,523 | 1,485 | 18,344 |
| Louisiana [5] | 42,512 | 38,952 | 43,993 | 42,500 | 43,943 | 42,623 | 44,206 | 44,436 | 41,411 | 43,304 | 42,679 | 44,498 | 515,057 |
| Michigan [6] | 1,344 | 1,266 | 1,348 | 1,362 | 1,381 | 1,302 | 1,362 | 1,319 | 1,297 | 1,360 | 1,285 | 1,346 | 15,972 |
| Mississippi | 4,865 | 4,572 | 4,983 | 4,807 | 4,983 | 5,100 | 4,455 | 4,924 | 5,041 | 5,217 | 4,748 | 4,924 | 58,619 |
| Montana [7] | 2,605 | 2,429 | 2,666 | 2,557 | 2,626 | 2,516 | 2,592 | 2,642 | 2,544 | 2,607 | 2,487 | 2,599 | 30,870 |
| Nebraska | 1,813 | 1,748 | 1,901 | 1,879 | 1,901 | 1,813 | 1,901 | 1,879 | 1,770 | 1,813 | 1,703 | 1,725 | 21,846 |
| New Mexico [8] | 9,015 | 8,465 | 9,345 | 8,905 | 9,125 | 8,905 | 9,235 | 9,455 | 9,235 | 9,455 | 9,235 | 9,566 | 109,941 |
| New York | 123 | 118 | 124 | 134 | 139 | 129 | 146 | 149 | 148 | 161 | 149 | 159 | 1,679 |
| North Dakota [9] | 2,278 | 2,128 | 2,278 | 2,153 | 1,977 | 1,852 | 2,077 | 2,228 | 2,052 | 2,103 | 2,102 | 2,302 | 25,080 |
| Ohio | 405 | 423 | 477 | 477 | 471 | 441 | 471 | 447 | 441 | 459 | 712 | 815 | 6,089 |
| Oklahoma | 16,823 | 15,818 | 17,612 | 17,095 | 17,556 | 17,225 | 17,035 | 18,311 | 15,717 | 16,328 | 16,955 | 15,987 | 201,962 |
| Pennsylvania | 407 | 357 | 392 | 428 | 448 | 417 | 473 | 447 | 437 | 478 | 412 | 387 | 5,083 |
| Texas | 79,205 | 75,297 | 82,137 | 80,182 | 83,114 | 80,182 | 84,091 | 84,092 | 81,159 | 84,091 | 80,184 | 84,101 | 977,835 |
| Utah [10] | 2,809 | 2,641 | 2,976 | 2,842 | 2,875 | 2,775 | 2,842 | 2,842 | 2,742 | 2,775 | 2,675 | 2,641 | 33,435 |
| West Virginia | 255 | 265 | 281 | 312 | 312 | 265 | 302 | 285 | 278 | 302 | 258 | 235 | 3,350 |
| Wyoming | 12,367 | 11,281 | 12,442 | 12,229 | 12,621 | 12,036 | 12,541 | 12,327 | 11,296 | 11,835 | 11,837 | 11,595 | 144,407 |
| Other States | 42 | 40 | 36 | 38 | 42 | 38 | 39 | 40 | 42 | 38 | 33 | 45 | [11] 473 |
| Total: 1963 | 226,420 | 212,437 | 234,289 | 228,270 | 234,499 | 226,853 | 235,144 | 236,830 | 225,207 | 233,610 | 226,321 | 232,843 | 2,752,723 |
| 1962 | 227,756 | 209,072 | 228,661 | 221,737 | 222,969 | 217,712 | 224,018 | 224,240 | 219,589 | 228,380 | 223,231 | 228,824 | 2,676,189 |
| Daily average 1963 | 7,304 | 7,587 | 7,558 | 7,609 | 7,565 | 7,562 | 7,585 | 7,640 | 7,507 | 7,536 | 7,544 | 7,511 | 7,542 |
| Pennsylvania grade (included above) | 968 | 896 | 969 | 1,041 | 1,076 | 970 | 1,082 | 1,029 | 1,021 | 1,090 | 962 | 931 | 12,034 |

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| 1964: | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 738 | 682 | 773 | 688 | 705 | 713 | 747 | 759 | 667 | 687 | 669 | 670 | 8,498 |
| Alaska | 945 | 885 | 859 | 913 | 949 | 916 | 941 | 941 | 914 | 946 | 909 | 941 | 11,059 |
| Arkansas | 2,300 | 2,156 | 2,314 | 2,202 | 2,266 | 2,224 | 2,229 | 2,250 | 2,162 | 2,231 | 2,169 | 2,234 | 26,737 |
| California [2] | 25,201 | 23,401 | 25,201 | 24,600 | 25,201 | 24,601 | 25,201 | 25,201 | 24,901 | 25,801 | 24,900 | 25,800 | 300,009 |
| Colorado [3] | 3,093 | 2,885 | 3,024 | 2,885 | 2,989 | 2,850 | 2,815 | 2,919 | 2,746 | 2,815 | 2,780 | 2,954 | 34,755 |
| Florida | 38 | 35 | 36 | 33 | 41 | 47 | 57 | 56 | 54 | 63 | 81 | 79 | 620 |
| Illinois | 6,251 | 5,720 | 6,037 | 5,923 | 5,851 | 5,860 | 6,032 | 5,813 | 5,752 | 5,754 | 5,497 | 5,678 | 70,168 |
| Indiana | 975 | 983 | 953 | 911 | 1,009 | 892 | 957 | 922 | 929 | 886 | 872 | 994 | 11,283 |
| Kansas [4] | 9,317 | 8,591 | 9,194 | 8,921 | 8,683 | 8,567 | 8,944 | 8,753 | 8,674 | 9,003 | 8,579 | 9,026 | 106,252 |
| Kentucky | 1,799 | 1,700 | 1,839 | 1,542 | 1,661 | 1,582 | 1,641 | 1,581 | 1,602 | 1,641 | 1,562 | 1,622 | 19,772 |
| Louisiana [5] | 47,273 | 44,526 | 47,274 | 46,175 | 45,625 | 43,976 | 45,075 | 45,075 | 43,976 | 45,075 | 46,175 | 49,473 | 549,698 |
| Michigan [6] | 1,361 | 1,243 | 1,311 | 1,312 | 1,293 | 1,307 | 1,330 | 1,289 | 1,279 | 1,313 | 1,254 | 1,309 | 15,601 |
| Mississippi | 4,883 | 4,656 | 4,996 | 4,712 | 4,656 | 4,769 | 4,656 | 4,656 | 4,542 | 4,883 | 4,485 | 4,883 | 56,777 |
| Montana [7] | 2,392 | 2,561 | 2,649 | 2,526 | 2,600 | 2,599 | 2,528 | 2,562 | 2,539 | 2,676 | 2,456 | 2,559 | 30,647 |
| Nebraska | 1,701 | 1,567 | 1,644 | 1,568 | 1,605 | 1,529 | 1,586 | 1,625 | 1,548 | 1,605 | 1,548 | 1,587 | 19,113 |
| New Mexico [8] | 9,564 | 8,995 | 9,792 | 9,337 | 9,565 | 9,109 | 9,451 | 9,223 | 9,337 | 9,678 | 9,678 | 10,134 | 113,863 |
| New York | 201 | 183 | 158 | 152 | 153 | 156 | 155 | 145 | 142 | 147 | 139 | 143 | 1,874 |
| North Dakota [9] | 2,271 | 2,362 | 2,127 | 2,068 | 1,621 | 1,953 | 2,122 | 2,184 | 2,229 | 2,335 | 2,207 | 2,252 | 25,731 |
| Ohio | 1,031 | 1,332 | 1,348 | 1,411 | 1,396 | 1,316 | 1,380 | 1,332 | 1,396 | 1,364 | 1,268 | 1,285 | 15,859 |
| Oklahoma | 17,222 | 16,066 | 17,449 | 17,233 | 17,468 | 16,662 | 17,158 | 16,690 | 16,135 | 17,244 | 16,262 | 16,935 | 202,524 |
| Pennsylvania | 475 | 402 | 481 | 538 | 381 | 395 | 409 | 395 | 417 | 426 | 387 | 407 | 5,113 |
| Texas | 83,118 | 78,162 | 85,107 | 82,067 | 84,114 | 81,138 | 82,175 | 82,127 | 80,160 | 84,095 | 81,166 | 86,096 | 989,525 |
| Utah [10] | 2,573 | 2,429 | 2,543 | 2,543 | 2,457 | 2,400 | 2,457 | 2,429 | 2,172 | 2,229 | 2,143 | 2,200 | 28,575 |
| West Virginia | 275 | 247 | 265 | 284 | 265 | 295 | 300 | 271 | 275 | 301 | 279 | 313 | 3,370 |
| Wyoming | 11,291 | 11,125 | 11,643 | 11,585 | 12,139 | 10,902 | 11,246 | 11,668 | 11,357 | 13,046 | 11,513 | 11,237 | 138,752 |
| Other States | 49 | 53 | 51 | 56 | 49 | 50 | 56 | 60 | 60 | 60 | 51 | 52 | [12] 647 |
| Total: 1964 | 236,337 | 222,947 | 239,068 | 232,185 | 234,742 | 226,808 | 231,648 | 230,926 | 225,965 | 236,304 | 229,029 | 240,863 | 2,786,822 |
| 1963 | 226,420 | 212,437 | 234,289 | 228,270 | 234,499 | 226,853 | 235,144 | 236,830 | 225,207 | 233,610 | 226,321 | 232,843 | 2,752,723 |
| Daily average 1964 | 7,624 | 7,688 | 7,712 | 7,739 | 7,572 | 7,560 | 7,473 | 7,449 | 7,532 | 7,623 | 7,634 | 7,770 | 7,614 |
| Pennsylvania grade (included above) | 1,120 | 968 | 1,118 | 1,117 | 929 | 967 | 994 | 912 | 959 | 1,002 | 943 | 1,009 | 12,038 |

[1] Includes field condensate.
[2] Conservation Committee of California Oil Producers.
[3] Colorado Oil Conservation Commission.
[4] Kansas Geological Survey.
[5] Louisiana Conservation Commission.
[6] Michigan Department of Conservation.
[7] Montana Oil Conservation Board.
[8] New Mexico Oil and Gas Conservation Commission.
[9] North Dakota Geological Survey.
[10] Utah Oil and Gas Conservation Commission.
[11] Includes Arizona (68), Missouri (53), Nevada (118), South Dakota (215), Tennessee (16), and Virginia (3).
[12] Arizona (64), Missouri (65), Nevada (255), South Dakota (247), Tennessee (10), and Virginia (6).

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TABLE 9.—Percentage of total crude petroleum produced in the United States, by States

| | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|---|---|---|---|---|
| Texas | 42.4 | 42.3 | 41.0 | 38.4 | 37.8 | 36.0 | 35.3 | 35.2 | 35.5 | 35.5 |
| Louisiana | 10.9 | 11.4 | 12.6 | 12.8 | 14.1 | 15.6 | 16.2 | 17.3 | 18.7 | 19.7 |
| California | 14.3 | 13.4 | 13.0 | 12.8 | 12.0 | 11.8 | 11.4 | 11.1 | 10.9 | 10.3 |
| Oklahoma | 8.2 | 8.2 | 8.2 | 8.2 | 7.7 | 7.5 | 7.4 | 7.6 | 7.3 | 7.3 |
| Wyoming | 4.0 | 4.0 | 4.2 | 4.7 | 4.9 | 5.2 | 5.4 | 5.1 | 5.2 | 5.0 |
| New Mexico | 3.3 | 3.4 | 3.6 | 4.0 | 4.1 | 4.2 | 4.3 | 4.1 | 4.0 | 4.1 |
| Kansas | 4.9 | 4.7 | 4.7 | 4.9 | 4.6 | 4.4 | 4.3 | 4.2 | 4.0 | 3.8 |
| Illinois | 3.3 | 3.1 | 2.9 | 3.3 | 3.0 | 3.0 | 2.9 | 2.9 | 2.7 | 2.5 |
| Mississippi | 1.5 | 1.6 | 1.5 | 1.6 | 1.9 | 2.0 | 2.1 | 2.1 | 2.1 | 2.0 |
| Colorado | 2.1 | 2.2 | 2.1 | 2.0 | 1.8 | 1.9 | 1.8 | 1.6 | 1.4 | 1.2 |
| Montana | .6 | .8 | 1.0 | 1.1 | 1.2 | 1.2 | 1.1 | 1.2 | 1.1 | 1.1 |
| Arkansas | 1.1 | 1.1 | 1.2 | 1.2 | 1.0 | 1.2 | 1.2 | 1.0 | 1.0 | 1.0 |
| Kentucky | .6 | .7 | .7 | .7 | 1.1 | .8 | .7 | .7 | .7 | .7 |
| Michigan | .5 | .4 | .4 | .4 | .4 | .6 | .7 | .6 | .6 | .6 |
| Other States | 2.3 | 2.7 | 2.9 | 3.9 | 4.4 | 4.6 | 4.7 | 4.8 | 4.8 | 4.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

## WELLS

In 1964 the number of wells drilled (42,963) was 1,577 more than in 1963 but 816 less than in 1962. Service wells are not included in this total. The percentage of dry holes to the total wells drilled increased from 39.5 percent in 1963 to 40.7 percent in 1964.

The largest increases in number of well completions were in Ohio (1,428), Kansas (344), and Pennsylvania (333). In Texas there was an overall decline in number of wells drilled, although there were moderate increases in the east and west districts of the State and the drilling activity along the Texas Gulf Coast was steady.

The number of oil wells reported in operation as of December 31, 1964, was 588,225; in 1963, 432 more wells were reported in operation. The average daily production per well was 12.9 barrels. In Louisiana, the largest gainer, the number of operating wells, increased by 1,814.

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**TABLE 10.—Production and reserves of crude petroleum in leading fields in the United States**

(Thousand barrels)

| Field [1] | State | 1963 | 1964 | Total since discovery [2] | Estimated reserves |
|---|---|---|---|---|---|
| East Texas | Texas | 40,777 | 40,055 | 8,624,910 | 1,485,090 |
| Wilmington | California | 34,647 | 35,350 | 1,013,578 | 586,422 |
| She-Vel-Tum | Oklahoma | 24,995 | 26,660 | 649,484 | 150,516 |
| Bay Marchand, Block 2 | Louisiana | 26,452 | 25,056 | 131,025 | 468,975 |
| Panhandle Field [3] | Texas | 13,270 | 25,052 | 1,110,867 | 536,133 |
| Caillou Island | Louisiana | 20,425 | 22,186 | 239,795 | 260,205 |
| Seeligson (all fields) | Texas | 20,860 | 21,926 | 285,880 | 214,120 |
| West Delta, Block 30 | Louisiana | 16,522 | 20,134 | 79,987 | 320,013 |
| South Pass, Block 24 | do | 17,451 | 19,968 | 212,286 | 537,714 |
| Ward-Estes N | Texas | 17,495 | 19,192 | 197,560 | 105,440 |
| Elk Basin | Montana, Wyoming | 24,370 | 18,702 | 272,101 | 127,899 |
| Midway-Sunset | California | 16,550 | 18,270 | 947,614 | 164,566 |
| Aneth | Utah | 22,841 | 16,954 | 172,358 | 279,642 |
| Timbiar Bay | Louisiana | 16,948 | 16,876 | 116,375 | 183,625 |
| Kelly-Snyder | Texas | 16,838 | 16,832 | 323,139 | 422,861 |
| South Pass, Block 27 | Louisiana | 17,451 | 16,822 | 72,843 | 238,157 |
| Huntington Beach | California | 15,741 | 15,785 | 730,318 | 150,284 |
| Rangley | Colorado | 16,262 | 15,342 | 364,393 | 235,607 |
| Golden Trend | Oklahoma | 18,427 | 14,292 | 283,316 | 76,684 |
| Wasson | Texas | 18,099 | 14,174 | 405,383 | 244,617 |
| Goldsmith | do | 15,995 | 13,465 | 346,481 | 113,519 |
| Burbank | Oklahoma | 13,685 | 13,417 | 435,209 | 64,791 |
| Loudon | Illinois | 14,125 | 12,612 | 302,943 | 47,057 |
| Sprayberry Trend | Texas | 11,984 | 11,880 | 184,379 | 90,621 |
| Lake Barre | Louisiana | 10,231 | 11,634 | 76,295 | 173,705 |
| Ventura | California | 12,470 | 11,576 | 603,920 | 120,956 |
| Vacuum | New Mexico | 8,223 | 11,171 | 120,390 | 164,610 |
| Swanson River-Soldatna | Alaska | 10,737 | 11,163 | 39,267 | 160,736 |
| Old Illinois | Illinois | 11,150 | 11,030 | 613,925 | 61,075 |
| Slaughter | Texas | 9,700 | 10,865 | 306,828 | 133,172 |
| Grand Isle, Block 16 | Louisiana | 8,861 | 10,584 | 41,218 | 133,782 |
| High Island | Texas | 9,556 | 10,181 | 94,493 | 80,507 |
| Colinga Nose | California | 11,510 | 10,147 | 872,533 | 111,016 |
| Maine Pass, Block 69 | Louisiana | 8,861 | 10,072 | 80,209 | 219,791 |
| Kern River | California | 9,298 | 9,772 | 393,438 | 56,091 |
| San Ardo | do | 9,968 | 9,657 | 144,626 | 97,205 |
| Katy, North | Texas | 9,684 | 9,452 | 163,361 | 136,639 |
| Hamilton Dome | Wyoming | 9,624 | 9,392 | 109,569 | 90,431 |
| Salt Creek | do | 8,017 | 9,004 | 419,701 | 90,299 |
| Hawkins | Texas | 8,868 | 9,002 | 206,078 | 228,922 |
| Salem | Illinois | 10,100 | 8,832 | 318,456 | 31,544 |
| Dover-Hennessey | Oklahoma | 9,010 | 8,667 | 29,963 | 130,037 |
| West Bay | Louisiana | 7,615 | 8,299 | 79,734 | 130,266 |
| Buena Vista | California | 8,669 | 8,282 | 524,231 | 90,785 |
| Tom O'Connor | Texas | 7,389 | 8,083 | 280,968 | 169,032 |
| San Hills | do | 8,055 | 8,019 | 111,497 | 85,503 |
| Hastings, East and West | do | 7,770 | 7,895 | 342,256 | 157,744 |
| McElroy | do | 7,747 | 7,773 | 218,294 | 131,706 |
| Bay St. Elaine | Louisiana | 7,925 | 7,705 | 71,644 | 81,356 |
| Citronelle | Alabama | 8,304 | 7,700 | 49,369 | 70,631 |
| Cowden (and Foster and Johnson) | Texas | 6,061 | 7,658 | 205,381 | 114,619 |
| Cowden, North | do | 7,246 | 7,522 | 180,826 | 69,174 |
| Caprock East | New Mexico | 6,231 | 7,503 | 69,752 | 70,248 |
| Keystone | Texas | 6,375 | 7,457 | 196,731 | 106,269 |
| Belridge South | California | 7,534 | 7,385 | 109,430 | 27,412 |
| Bayou Sale | Louisiana | 7,307 | 7,283 | 94,977 | 105,033 |
| Inglewood | California | 6,335 | 7,173 | 247,941 | 53,552 |
| Howard Glasscock | Texas | 7,071 | 7,111 | 230,493 | 46,507 |
| Cuyama South | California | 8,189 | 7,073 | 175,560 | 108,332 |

[1] Fields under 7 million barrels not shown for current year.
[2] Includes revisions.
[3] Includes Badger, Borger-Pantex, Dial, Finley, and Pampa West.

Source: Oil and Gas Journal.

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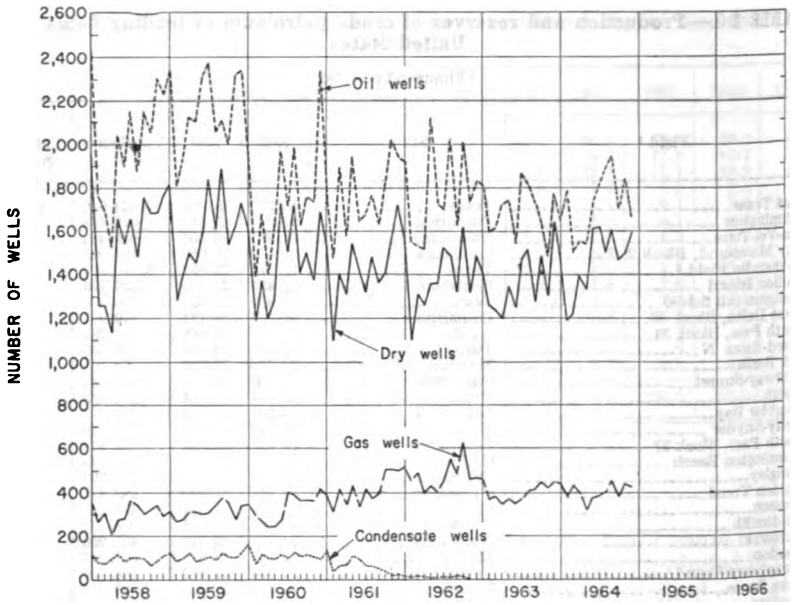


FIGURE 4.—Wells drilled for oil and gas in the United States, 1958–64, by months.

TABLE 11.—Well completions in the United States, by months[1]

| Wells | January | February | March | April | May | June | July | August | September | October | November | December | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Number | Percent |
| 1963: | | | | | | | | | | | | | | |
| Oil | 1,809 | 1,593 | 1,611 | 1,721 | 1,737 | 1,542 | 1,860 | 1,809 | 1,725 | 1,633 | 1,480 | 1,768 | 20,288 | 49.0 |
| Gas[2] | 459 | 366 | 379 | 342 | 367 | 349 | 367 | 406 | 412 | 443 | 418 | 443 | 4,751 | 11.5 |
| Dry | 1,405 | 1,251 | 1,229 | 1,194 | 1,342 | 1,248 | 1,469 | 1,513 | 1,271 | 1,485 | 1,302 | 1,638 | 16,347 | 39.5 |
| Total | 3,673 | 3,210 | 3,219 | 3,257 | 3,446 | 3,139 | 3,696 | 3,728 | 3,408 | 3,561 | 3,200 | 3,849 | 41,386 | 100.0 |
| 1964: | | | | | | | | | | | | | | |
| Oil | 1,647 | 1,788 | 1,500 | 1,554 | 1,542 | 1,730 | 1,819 | 1,892 | 1,945 | 1,705 | 1,836 | 1,662 | 20,620 | 48.0 |
| Gas[2] | 441 | 386 | 437 | 397 | 322 | 375 | 389 | 400 | 455 | 386 | 440 | 427 | 4,855 | 11.3 |
| Dry | 1,450 | 1,191 | 1,222 | 1,400 | 1,332 | 1,611 | 1,617 | 1,505 | 1,603 | 1,469 | 1,494 | 1,594 | 17,488 | 40.7 |
| Total | 3,538 | 3,365 | 3,159 | 3,351 | 3,196 | 3,716 | 3,825 | 3,797 | 4,003 | 3,560 | 3,770 | 3,683 | 42,963 | 100.0 |

[1] Excludes service wells.
[2] Includes condensate wells.

Source: Oil and Gas Journal.

## CONSUMPTION AND DISTRIBUTION

The total demand for crude oil in the United States in 1964 was 8,832,700 barrels per day, a gain of 1.4 percent for the year. The 1964 demand for domestic crude oil (7,637,000 barrels per day) was 55,800 barrels per day more than that for 1963, and the demand for foreign crude oil (1,195,700 barrels per day) was 64,500 barrels per day more than that for 1963.

**Runs to Stills.**—Crude runs to stills in 1964 averaged 8,857,000 barrels per day, including 7,662,000 barrels per day of domestic crude

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**TABLE 12.—Well completions in the United States by States, and districts[1]**

| State and district | 1963 | | | | 1964 | | | |
|---|---|---|---|---|---|---|---|---|
| | Oil | Gas[2] | Dry | Total | Oil | Gas[2] | Dry | Total |
| Alabama | 71 | | 24 | 95 | 17 | | 32 | 49 |
| Alaska | 8 | 5 | 12 | 25 | 4 | 2 | 15 | 21 |
| Arizona | 1 | 2 | 13 | 16 | | 6 | 34 | 40 |
| Arkansas | 207 | 43 | 204 | 454 | 167 | 48 | 206 | 421 |
| California | 1,707 | 118 | 566 | 2,391 | 1,616 | 123 | 550 | 2,289 |
| Colorado | 96 | 93 | 409 | 598 | 99 | 70 | 395 | 564 |
| Florida | 1 | | 1 | 2 | 4 | | 8 | 12 |
| Georgia | | | | | | | 2 | 2 |
| Idaho | | | 2 | 2 | | | 1 | 1 |
| Illinois | 746 | 12 | 764 | 1,522 | 665 | 17 | 801 | 1,483 |
| Indiana | 271 | 8 | 450 | 729 | 224 | 2 | 321 | 547 |
| Iowa | 1 | | 12 | 13 | | | 12 | 12 |
| Kansas | 2,017 | 227 | 1,590 | 3,834 | 2,259 | 219 | 1,700 | 4,178 |
| Kentucky | 653 | 162 | 825 | 1,640 | 485 | 194 | 655 | 1,334 |
| Louisiana: | | | | | | | | |
| North | 1,482 | 339 | 1,036 | 2,857 | 1,486 | 228 | 1,204 | 2,918 |
| South | 751 | 204 | 772 | 1,727 | 663 | 220 | 682 | 1,565 |
| Offshore | 312 | 71 | 307 | 690 | 393 | 90 | 364 | 847 |
| Total Louisiana | 2,545 | 614 | 2,115 | 5,274 | 2,542 | 538 | 2,250 | 5,330 |
| Maryland | | | 1 | 1 | | | 1 | 1 |
| Michigan | 143 | 84 | 382 | 609 | 84 | 53 | 385 | 522 |
| Mississippi | 254 | 22 | 448 | 724 | 188 | 18 | 513 | 719 |
| Missouri | | | 9 | 9 | | | 12 | 12 |
| Montana | 155 | 15 | 212 | 382 | 142 | 16 | 251 | 409 |
| Nebraska | 153 | 1 | 366 | 520 | 136 | 2 | 320 | 458 |
| Nevada | | | 2 | 2 | 2 | | 6 | 8 |
| New Jersey | | | 1 | 1 | | | 1 | 1 |
| New Mexico: | | | | | | | | |
| West | 112 | 239 | 119 | 470 | 48 | 291 | 85 | 424 |
| East | 480 | 42 | 267 | 789 | 672 | 49 | 318 | 1,039 |
| Total New Mexico | 592 | 281 | 386 | 1,259 | 720 | 340 | 403 | 1,463 |
| New York | 246 | 22 | 40 | 308 | 123 | 45 | 57 | 225 |
| North Dakota | 84 | | 98 | 182 | 113 | | 162 | 275 |
| Ohio | 475 | 217 | 357 | 1,049 | 737 | 288 | 1,452 | 2,477 |
| Oklahoma | 2,273 | 430 | 1,260 | 3,963 | 2,256 | 464 | 1,286 | 4,006 |
| Oregon | | | 1 | 1 | | | 2 | 2 |
| Pennsylvania | 250 | 220 | 73 | 543 | 370 | 358 | 148 | 876 |
| South Dakota | 1 | | 9 | 10 | 3 | | 23 | 26 |
| Tennessee | 3 | | 26 | 29 | | | 19 | 19 |
| Texas: | | | | | | | | |
| Gulf Coast | 810 | 383 | 882 | 2,075 | 762 | 392 | 907 | 2,061 |
| West | 2,080 | 163 | 799 | 3,042 | 2,129 | 155 | 867 | 3,151 |
| East | 307 | 91 | 321 | 719 | 407 | 123 | 359 | 889 |
| Other districts | 3,485 | 671 | 2,908 | 7,064 | 3,449 | 658 | 2,517 | 6,624 |
| Total Texas | 6,682 | 1,308 | 4,910 | 12,900 | 6,747 | 1,328 | 4,650 | 12,725 |
| Utah | 67 | 21 | 121 | 209 | 50 | 19 | 109 | 178 |
| Virginia | | 2 | 1 | 3 | 1 | 2 | 2 | 5 |
| Washington | | | 7 | 7 | | | 5 | 5 |
| West Virginia | 257 | 791 | 151 | 1,199 | 411 | 652 | 170 | 1,233 |
| Wyoming | 329 | 53 | 499 | 881 | 455 | 51 | 529 | 1,035 |
| Total United States | 20,288 | 4,751 | 16,347 | 41,386 | 20,620 | 4,855 | 17,488 | 42,963 |

[1] Excludes service wells.
[2] Includes condensate wells.

Source: Oil and Gas Journal.

oil and 1,195,000 barrels per day of foreign-origin crude. This represented a gain of 2.0 percent for the year in total crude runs to stills, a 1.4-percent increase for domestic crude oil and a 5.8-percent increase for foreign crude.

**Distribution.**—The Bureau of Mines collects data on receipts of domestic and foreign crude petroleum at refineries in the United States. These receipts include the crude runs to stills, a small quantity used as refinery fuel, and any increase in crude stocks at refineries.

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**TABLE 13.—Producing oil wells in the United States and average production per well per day by States**

| State | Producing oil wells | | | |
|---|---|---|---|---|
| | 1963 | | 1964 | |
| | Approximate number of producing oil wells, Dec. 31 | Average production per well per day (barrels) [1] | Approximate number of producing oil wells, Dec. 31 | Average production per well per day (barrels) [1] |
| Alabama | 502 | 52.8 | 519 | 45.5 |
| Alaska | 54 | 555.2 | 56 | 549.4 |
| Arkansas | 6,010 | 12.6 | 6,018 | 12.1 |
| California | 40,233 | 20.7 | 40,916 | 20.2 |
| Colorado | 2,030 | 50.7 | 1,981 | 47.3 |
| Illinois | 30,149 | 6.8 | 29,500 | 6.4 |
| Indiana | 5,951 | 5.6 | 5,381 | 5.4 |
| Kansas | 46,951 | 6.4 | 46,715 | 6.2 |
| Kentucky | r 14,903 | r 2.9 | 15,226 | 3.6 |
| Louisiana: | | | | |
| Gulf Coast | 14,571 | 89.8 | 15,114 | 91.3 |
| Northern | 13,067 | 10.7 | 14,338 | 10.7 |
| Total Louisiana | 27,638 | 52.2 | 29,452 | 52.6 |
| Michigan | 4,234 | 10.3 | 4,151 | 10.2 |
| Mississippi | 2,682 | 61.3 | 2,580 | 59.0 |
| Montana | 3,642 | 23.1 | 3,329 | 24.0 |
| Nebraska | 1,726 | 34.3 | 1,711 | 30.4 |
| New Mexico: | | | | |
| Southeastern | 14,921 | 18.8 | 15,651 | 18.6 |
| Northwestern | 1,875 | 14.7 | 1,919 | 14.4 |
| Total New Mexico | 16,796 | 18.3 | 17,570 | 18.1 |
| New York | 13,431 | 0.3 | 12,526 | 0.4 |
| North Dakota | 1,824 | 37.9 | 1,881 | 38.0 |
| Ohio | r 14,605 | r 1.1 | 13,752 | 3.1 |
| Oklahoma | 81,475 | 6.8 | 80,511 | 6.8 |
| Pennsylvania | 54,062 | 0.2 | 53,065 | 0.3 |
| Texas: [2] | | | | |
| Gulf Coast | 19,601 | 26.4 | 19,562 | 26.7 |
| East Texas Proper | 19,104 | 6.2 | 27,758 | 5.1 |
| West Texas | 66,144 | 18.2 | 67,068 | 18.2 |
| Other districts | 93,221 | 9.1 | 84,731 | 9.5 |
| Total Texas | 198,070 | 13.5 | 199,119 | 13.6 |
| Utah | 835 | 108.6 | 840 | 93.2 |
| West Virginia | 13,044 | 0.7 | 13,205 | 0.7 |
| Wyoming | 7,611 | 52.1 | 8,019 | 49.1 |
| Other States: | | | | |
| Arizona | 9 | 28.7 | 8 | 20.6 |
| Florida | 12 | 110.5 | 19 | 109.3 |
| Missouri | 105 | 1.4 | 100 | 1.7 |
| Nevada | 4 | 80.8 | 5 | 154.8 |
| South Dakota | 24 | 27.4 | 24 | 28.1 |
| Tennessee | 39 | 1.1 | 38 | 0.7 |
| Virginia | 6 | 1.5 | 8 | 2.3 |
| Total other States | 199 | 13.3 | 202 | 17.3 |
| Total United States | r 588,657 | 12.7 | 588,225 | 12.9 |

r Revised.
[1] Based on the average number of wells during the year.
[2] Division of the Texas Railroad Commission.

Classification of receipts, by State of origin, shows receipts from local production (intrastate), receipts from other States (interstate), and receipts of imported crude. Classification by method of transportation indicated the final receipts by water, pipeline, and tank car and truck. Receipts of domestic crude by water usually were moved by pipeline from the point of production to the point of water shipment.

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Receipts of domestic and foreign crude petroleum at refineries totaled 3,244.7 million barrels in 1964; foreign crude (438.8 million barrels) represented 13.5 percent of this total. The refineries processed 3,241.6 million barrels and reported 0.6 million barrels used for refinery fuel and losses; the difference, 2.5 million barrels, was added to stocks.

Refineries received 75.7 percent of their supply of crude oil by pipeline, 23.1 percent by water, and the remainder by tank cars and trucks.

The major waterborne shipments were from the gulf coast to the east coast and between States in the gulf coast districts. There are also interstate and intrastate shipments by water on the west coast and Mississippi River.

All foreign crude receipts into the east coast and the major part of those into the gulf coast are received by water. Refineries in District 2, which comprises the Great Lakes and the mid-continent areas, receive most of their foreign crude by pipeline from Canada; however, some is barged up the river from gulf coast ports where it arrives by tanker. Very little foreign crude is processed at refineries in the Rocky Mountain States; such crude as is used arrives at the refineries by pipeline and rail from Canada. West coast refiners received 63.7 percent of their foreign crude supply by water, the rest was received by pipeline at refineries near the Canadian border.

**TABLE 14.—Receipts of domestic and foreign crude petroleum at refineries in the United States**

(Million barrels)

| Method of transportation | 1960 | 1961 | 1962 | 1963 | 1964 p |
|---|---|---|---|---|---|
| **By water:** | | | | | |
| Intrastate | 125.8 | 136.0 | 140.9 | 129.8 | 125.9 |
| Interstate | 261.6 | 268.3 | 277.6 | 307.1 | 285.9 |
| Foreign | 330.0 | 317.1 | 330.2 | 322.2 | 337.1 |
| Total by water | 717.4 | 721.4 | 748.7 | 759.1 | 748.9 |
| **By pipeline:** | | | | | |
| Intrastate | 1,291.6 | 1,286.1 | 1,333.4 | 1,377.2 | 1,426.0 |
| Interstate | 857.4 | 871.9 | 865.8 | 900.8 | 929.4 |
| Foreign | 40.6 | 64.1 | 79.7 | 90.1 | 101.7 |
| Total by pipeline | 2,189.6 | 2,222.1 | 2,278.9 | 2,368.1 | 2,457.1 |
| **By tank cars and trucks:** | | | | | |
| Intrastate | 33.9 | 34.9 | 36.9 | 36.2 | 34.4 |
| Interstate | 10.1 | 8.1 | 6.2 | 4.5 | 4.3 |
| Foreign | ---- | 0.5 | 0.1 | 0.1 | ---- |
| Total by tank cars and trucks | 44.0 | 43.5 | 43.2 | 40.8 | 38.7 |
| Grand total | 2,951.0 | 2,987.0 | 3,070.8 | 3,168.0 | 3,244.7 |

p Preliminary.

**Demand by States of Origin.**—Distribution of domestic oil by refining States and districts can be analyzed from receipts of crude at refineries. When long-distance shipments are involved, various crudes may be mixed in transit or storage, and identification of origin may be only approximate.

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## TABLE 15.—Refinery receipts of domestic crude oil by States and districts, 1964

(Thousand barrels)

| Receiving State and district | Total domestic receipts | Intrastate receipts | Interstate receipts from | | | | | | | | | | | | | | | | | | Total receipts |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Alabama Mississippi | Arkansas | California Nevada Alaska | Colorado | New York, Florida | Illinois | Indiana Michigan | Kansas | Ohio Kentucky | Louisiana | Montana | Nebraska N. Dakota and S. Dakota | New Mexico | Oklahoma | Texas | Utah | West Virginia | Wyoming | |
| Delaware, Massachusetts, Rhode Island | 4,951 | | | | | | | | | | | 4,576 | | | | | 375 | | | | 4,951 |
| Florida, Georgia, South Carolina, Virginia | 2,472 | | 1,403 | | | | | | | | | | | | | | 1,069 | | | | 2,472 |
| Maryland | | | | | | | | | | | | | | | | | | | | | |
| New Jersey | 53,515 | | 8,402 | | | | 609 | | | | | 30,811 | | | | | 13,693 | | | | 53,515 |
| New York | 13,245 | | | | | | | 2,302 | | | 1,141 | | 3,480 | | | 4,936 | 1,386 | | | | 13,245 |
| Pennsylvania: | | | | | | | | | | | | | | | | | | | | | |
| East | 99,871 | | 5,571 | | | | | | | | | 39,348 | | | | | 54,952 | | | | 99,871 |
| West | 15,635 | 5,752 | | | | 444 | 2,007 | | 223 | | 1,469 | | 2,915 | 442 | | 850 | | | 1,533 | | 9,883 |
| West Virginia | 1,944 | 1,118 | | | | | | | | | 826 | | | | | | | | | | 826 |
| Total District 1 | 191,633 | 6,870 | 15,376 | | | 444 | 2,616 | 2,302 | 223 | | 3,436 | 74,735 | 6,395 | 442 | | 5,786 | 71,475 | | 1,533 | | 184,763 |
| Illinois | 218,044 | 28,473 | | | | 2,058 | | | 774 | 11,759 | | 483 | 858 | 2,281 | 30,096 | 31,422 | 98,318 | 1,061 | | 10,461 | 189,571 |
| Indiana | 152,845 | 1,522 | | | | 4,051 | | 8,242 | 166 | 16,871 | 29 | | 10,551 | 7,643 | 8,449 | 34,110 | 30,457 | | | 30,754 | 151,323 |
| Kansas | 110,867 | 70,560 | | | | 3,226 | | | | | | | | 958 | 7,047 | 16,052 | 12,938 | | | 86 | 40,307 |
| Kentucky, Tennessee | 42,417 | 21,972 | 2,031 | | | | | | 1,990 | | 36 | 16,388 | | | | | | | | | 20,445 |
| Michigan | 46,705 | 17,423 | | | | | | 5,992 | | | | | | | | | 13,601 | | | 9,689 | 29,282 |
| Minnesota, Wisconsin | 10,802 | | | | | | | | | | | | 20 | 8,670 | | | | | | 2,112 | 10,802 |
| Missouri, Nebraska | 24,798 | 39 | | | | | | | | 276 | | | | 559 | 9,166 | 3,273 | 4,321 | | | 7,164 | 24,759 |
| North Dakota | 16,564 | 16,440 | | | | | | | | | | | 124 | | | | | | | | 124 |
| Ohio: | | | | | | | | | | | | | | | | | | | | | |
| East | 37,256 | 12,190 | | | | 1,303 | | 19,994 | | | | | 114 | | | | | | | 4,223 | 25,634 |
| West | 103,940 | | 2,683 | 2,169 | | 3,811 | | 8,924 | 336 | | | 23,262 | | 4,030 | 2,871 | 7,650 | 45,136 | | | 2,500 | 103,372 |
| Oklahoma | 136,018 | 106,058 | | | | 124 | | | | 7,682 | | | | | 2,977 | | 16,475 | 2,702 | | | 29,960 |
| Total District 2 | 900,256 | 274,677 | 4,714 | 2,169 | | 14,573 | | 43,152 | 3,266 | 36,588 | 65 | 40,133 | 11,667 | 24,141 | 60,606 | 92,507 | 221,246 | 3,763 | | 66,989 | 625,579 |

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| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 4,321 | 841 | 2,963 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 517 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 3,480 |
| Arkansas | 28,018 | 26,409 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 2,209 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 2,209 |
| Louisiana | 277,272 | 211,050 | 22,800 | 219 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 29 | 43,174 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 66,222 |
| Mississippi | 47,500 | 8,843 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 38,657 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 38,657 |
| New Mexico | 10,823 | 10,818 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 5 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 5 |
| Texas | 898,185 | 683,007 | 746 | ---- | ---- | ---- | ---- | 4 | ---- | ---- | 171,482 | ---- | ---- | ---- | 38,621 | 3,181 | 1,244 | ---- | ---- | ---- | ---- | ---- | ---- | 215,178 |
| Total District 3 | 1,266,719 | 940,968 | 26,509 | 219 | ---- | ---- | ---- | 4 | ---- | ---- | 212,865 | ---- | ---- | ---- | 38,621 | 3,210 | 43,179 | 1,244 | ---- | ---- | ---- | ---- | ---- | 325,761 |
| Colorado | 11,206 | 1,030 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 709 | ---- | ---- | 67 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 9,400 |
| Montana | 27,935 | 10,070 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 17,865 |
| Utah | 33,043 | 7,844 | ---- | ---- | [1] 16,831 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 80 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 8,287 |
| Wyoming | 40,060 | 38,402 | ---- | ---- | 1,652 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 36 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1,588 |
| Total District 4 | 112,234 | 57,406 | ---- | 1 | 18,383 | ---- | ---- | ---- | ---- | ---- | ---- | 709 | 36 | 147 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 35,552 |
| California | 326,614 | 300,380 | ---- | ---- | 4,753 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 5,486 | ---- | ---- | 15,995 | ---- | ---- | ---- | ---- | ---- | ---- | 26,234 |
| Other States [1] | 8,381 | 6,028 | ---- | ---- | 2,353 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 2,353 |
| Total District 5 | 334,995 | 306,408 | ---- | ---- | 7,106 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 5,486 | ---- | ---- | 15,995 | ---- | ---- | ---- | ---- | ---- | ---- | 28,587 |
| United States, total | 2,805,837 | 1,586,329 | 46,599 | 2,388 | 7,107 | 33,400 | 2,616 | 45,454 | 3,489 | 36,592 | 3,601 | 327,733 | 18,771 | 24,619 | 104,760 | 101,503 | 335,900 | 21,022 | 1,533 | 102,541 | 1,219,608 | | | |
| Daily average | 7,666 | 4,334 | 127 | 6 | 20 | 91 | 7 | 124 | 10 | 100 | 9 | 896 | 51 | 67 | 287 | 277 | 918 | 57 | 4 | 281 | 3,332 | | | |

[1] Alaska, Hawaii, Oregon, and Washington.
[2] Oil from Arizona.

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**TABLE 16.—Crude runs to stills and refinery receipts of crude oil by origin of the crude and method of transportation, 1964**

(Thousand barrels)

| State and district | Crude runs to stills | Refinery fuel use and losses | Refinery receipts of domestic crude— | | | | | | | | Refinery receipts of foreign crude | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | By State of origin of domestic crude | Change in refinery stocks | By receiving State and method of transportation | | | | | | | |
| | | | | | Intrastate | | | Interstate | | | | |
| | | | | | Pipelines | Tank cars and trucks | Tankers and barges | Pipelines | Tank cars and trucks | Tankers and barges | Pipelines | Tankers and barges |
| Delaware, Massachusetts, Rhode Island | 42,158 | | | +97 | | | | | | 4,951 | | 37,304 |
| Florida, Georgia, South Carolina, Virginia | 17,412 | 2 | 609 | −69 | | | | | 497 | 1,975 | | 14,873 |
| Maryland | 5,796 | −6 | | −40 | | | | | | | | 5,750 |
| New Jersey | 156,584 | 1 | | +1,207 | | | | | | 53,515 | | 104,277 |
| New York | 30,366 | | 2,007 | −49 | | | | 13,245 | | | 7,871 | 9,201 |
| Pennsylvania: | | | | | | | | | | | | |
| East | 173,765 | 82 | | −651 | | | | | | 99,871 | | 73,325 |
| West | 15,658 | −11 | 5,752 | −12 | 5,646 | 106 | | 8,783 | 247 | 853 | | |
| West Virginia | 1,919 | 1 | 2,651 | +24 | 1,076 | 42 | | 467 | 359 | | | |
| Total District 1 | [1] 443,658 | 69 | 11,019 | +507 | 6,722 | 148 | | 22,495 | 1,103 | 161,165 | 7,871 | 244,730 |
| Illinois | 218,763 | 12 | 73,927 | −561 | 28,379 | 94 | | 189,088 | | 483 | 170 | |
| Indiana | 153,238 | 1 | 4,286 | −215 | 863 | 659 | | 151,128 | 195 | | 179 | |
| Kansas | 110,894 | 38 | 107,152 | −65 | 68,566 | 1,994 | | 40,276 | 31 | | | |
| Kentucky, Tennessee | 42,500 | 4 | 21,972 | −87 | 6,130 | 244 | 15,598 | | | 20,445 | | |
| Michigan | 51,659 | 26 | 18,148 | −9 | 17,022 | 401 | | 29,282 | | | 4,971 | |
| Minnesota, Wisconsin | 37,160 | −20 | | −207 | | | | 9,555 | 22 | 1,225 | 26,131 | |
| Missouri, Nebraska | 24,696 | | 15,952 | +102 | | 39 | | 24,759 | | | | |
| North Dakota | 16,536 | | [2] 25,146 | +28 | 15,816 | 624 | | | 124 | | | |
| Ohio: | | | | | | | | | | | | |
| East | 37,235 | | 15,691 | +21 | 10,646 | 513 | 463 | 25,634 | | | | |
| West | 111,548 | −18 | | −151 | 539 | 29 | | 103,372 | | | 6,230 | [3] 1,209 |
| Oklahoma | 136,659 | 29 | 207,561 | −670 | 104,088 | 1,970 | | 29,960 | | | | |
| Total District 2 | 940,888 | 72 | 489,835 | −1,814 | 252,049 | 6,567 | 16,061 | 603,054 | 372 | 22,153 | 37,681 | 1,209 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 4,876 | −14 | 9,374 | +40 | | | 841 | | 261 | 3,219 | | 581 |
| Arkansas | 28,798 | −29 | 28,797 | −151 | 25,894 | 1,015 | | 2,135 | 74 | | | |
| Louisiana | 276,689 | 36 | 538,783 | +584 | 163,305 | 3,355 | 44,390 | 63,595 | 237 | 2,390 | | 37 |
| Mississippi | 47,020 | 2 | 46,909 | +478 | 7,220 | 1,623 | | 38,657 | | | | |
| New Mexico | 10,811 | 8 | 115,578 | +4 | 9,996 | 822 | | | 5 | | | |
| Texas | 898,023 | 146 | 1,018,907 | +35 | 635,425 | 9,027 | 38,555 | 125,312 | 1 | 89,865 | [4] 19 | |
| Total District 3 | 1,266,217 | 149 | 1,758,348 | +990 | 841,340 | 15,842 | 83,786 | 229,699 | 578 | 95,474 | 19 | 618 |
| Colorado | 11,243 | −7 | 34,430 | −30 | 399 | 631 | | 10,109 | 67 | | | |
| Montana | 32,028 | 2 | 28,841 | −33 | 9,801 | 269 | | 17,865 | | | [5] 4,062 | |
| Utah | 32,930 | −5 | 28,846 | +118 | 7,352 | 492 | | 24,642 | 557 | | | |
| Wyoming | 40,648 | 5 | 141,003 | −37 | 37,619 | 843 | | | 1,588 | | 566 | |
| Total District 4 | 116,849 | −5 | 233,120 | +18 | 55,171 | 2,235 | | 52,616 | 2,212 | | 4,628 | |
| California | 394,793 | 428 | 302,733 | +2,581 | 264,708 | 9,618 | 26,054 | 21,481 | | 4,753 | | 71,188 |
| Other States [6] | 79,227 | −102 | 10,782 | +139 | 6,028 | | | | | 2,353 | 51,526 | 19,357 |
| Total District 5 | 474,020 | 326 | 313,515 | +2,720 | 270,736 | 9,618 | 26,054 | 21,481 | | 7,106 | 51,526 | 90,545 |
| United States, total | 3,241,632 | 611 | 2,805,837 | +2,421 | 1,426,018 | 34,410 | 125,901 | 929,345 | 4,265 | 285,898 | [7] 101,725 | 337,102 |
| Daily Average | 8,857 | 2 | 7,666 | +7 | 3,896 | 94 | 344 | 2,539 | 11 | 782 | 278 | 921 |

[1] Includes 270,461,000 barrels in Delaware River Valley.
[2] Includes 36,000 barrels from South Dakota.
[3] Transhipped from PAD District 3.
[4] Tank cars and trucks.
[5] Includes tank cars and trucks 34,000 barrels.
[6] Alaska, Arizona, Hawaii, Oregon, and Washington.
[7] Excludes crude oil imported for direct fuel use by pipelines.

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**TABLE 17.—Daily average total demand for crude petroleum in the United States, 1963–64, by States of origin and months**

(Thousand barrels)

| State | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| Alabama | 30.0 | 17.9 | 22.6 | 33.4 | 15.0 | 33.9 | 25.5 | 12.9 | 24.1 | 34.5 | 16.5 | 35.7 | 25.2 |
| Alaska | 37.3 | 19.8 | 32.4 | 21.5 | 32.0 | 26.0 | 21.9 | 47.3 | 26.4 | 33.0 | 27.8 | 35.9 | 30.3 |
| Arkansas | 67.8 | 78.1 | 76.8 | 70.9 | 79.6 | 76.0 | 67.2 | 82.9 | 79.5 | 76.1 | 76.0 | 73.8 | 75.3 |
| California | 801.0 | 782.3 | 845.5 | 786.9 | 790.0 | 823.3 | 864.9 | 829.6 | 871.4 | 834.1 | 846.5 | 834.5 | 826.1 |
| Colorado | 115.6 | 113.5 | 108.2 | 99.5 | 101.9 | 107.2 | 109.4 | 115.6 | 100.2 | 93.0 | 122.5 | 78.0 | 105.3 |
| Florida | 3.8 | ---- | ---- | 3.3 | ---- | 0.7 | 3.0 | ---- | 1.0 | 2.7 | ---- | 2.9 | 1.5 |
| Illinois | 229.0 | 199.0 | 208.4 | 197.8 | 188.0 | 193.0 | 216.8 | 202.3 | 210.9 | 225.5 | 193.6 | 213.7 | 206.7 |
| Indiana | 34.0 | 34.7 | 31.2 | 31.9 | 31.5 | 37.5 | 34.1 | 28.6 | 33.4 | 35.4 | 27.3 | 34.2 | 32.8 |
| Kansas | 285.9 | 331.0 | 308.8 | 291.2 | 267.4 | 307.6 | 325.6 | 309.6 | 298.6 | 269.9 | 282.3 | 332.1 | 300.7 |
| Kentucky | 48.2 | 65.3 | 47.2 | 45.6 | 49.2 | 46.2 | 52.5 | 42.5 | 54.6 | 47.6 | 55.5 | 54.3 | 50.6 |
| Louisiana | 1,365.7 | 1,423.7 | 1,372.1 | 1,416.4 | 1,436.3 | 1,445.5 | 1,402.1 | 1,374.5 | 1,435.8 | 1,439.5 | 1,428.8 | 1,435.4 | 1,414.3 |
| Michigan | 44.5 | 42.9 | 44.6 | 42.6 | 44.9 | 45.1 | 44.8 | 43.9 | 43.5 | 43.5 | 39.1 | 43.8 | 43.6 |
| Mississippi | 145.6 | 175.1 | 148.5 | 168.1 | 166.0 | 170.3 | 148.7 | 163.6 | 162.9 | 161.5 | 167.9 | 157.2 | 161.1 |
| Montana | 95.2 | 83.7 | 92.4 | 76.4 | 86.5 | 91.2 | 98.5 | 88.5 | 90.0 | 79.8 | 81.2 | 90.3 | 87.9 |
| Nebraska | 60.8 | 63.2 | 61.8 | 51.3 | 57.0 | 74.8 | 60.5 | 50.4 | 66.7 | 59.1 | 58.0 | 54.9 | 59.8 |
| New Mexico | 312.5 | 307.9 | 318.7 | 302.3 | 287.6 | 324.9 | 294.1 | 280.5 | 289.5 | 293.2 | 313.9 | 287.1 | 300.8 |
| New York | 3.9 | 4.2 | 4.3 | 4.2 | 4.6 | 4.3 | 4.1 | 3.8 | 5.5 | 5.4 | 5.3 | 5.5 | 4.6 |
| North Dakota | 78.0 | 71.5 | 74.8 | 70.2 | 56.9 | 40.1 | 76.5 | 75.3 | 62.6 | 66.5 | 69.8 | 76.6 | 68.3 |
| Ohio | 14.7 | 13.0 | 14.4 | 12.8 | 13.7 | 15.7 | 14.8 | 17.8 | 14.3 | 11.7 | 25.7 | 31.5 | 16.7 |
| Oklahoma | 550.8 | 565.3 | 606.1 | 555.3 | 559.9 | 585.7 | 567.1 | 593.6 | 522.9 | 501.9 | 562.0 | 488.8 | 554.9 |
| Pennsylvania | 16.0 | 13.2 | 16.6 | 13.9 | 11.8 | 17.4 | 14.5 | 11.7 | 16.7 | 13.0 | 13.3 | 16.7 | 14.6 |
| Texas | 2,699.5 | 2,857.1 | 2,649.5 | 2,568.6 | 2,650.1 | 2,633.3 | 2,648.6 | 2,802.3 | 2,666.8 | 2,773.9 | 2,721.2 | 2,735.4 | 2,700.0 |
| Utah | 90.3 | 95.6 | 95.1 | 87.6 | 94.8 | 100.9 | 89.6 | 89.1 | 88.9 | 98.9 | 92.8 | 92.5 | 93.0 |
| West Virginia | 9.6 | 9.4 | 10.4 | 8.5 | 8.5 | 8.2 | 9.5 | 9.4 | 12.0 | 9.9 | 9.6 | 8.9 | 9.5 |
| Wyoming | 385.3 | 434.7 | 389.4 | 361.4 | 398.1 | 448.2 | 439.7 | 430.6 | 394.8 | 357.2 | 384.6 | 336.7 | 396.3 |
| Other States | 1.5 | 1.4 | 1.3 | 1.3 | 1.4 | 1.3 | 1.4 | 1.3 | 1.4 | 1.2 | 1.1 | 1.5 | [1] 1.3 |
| Total domestic crude | 7,526.5 | 7,803.5 | 7,581.1 | 7,322.9 | 7,432.7 | 7,658.3 | 7,635.4 | 7,707.6 | 7,574.4 | 7,568.0 | 7,622.3 | 7,557.9 | 7,581.2 |
| Foreign crude | 1,191.7 | 1,201.7 | 1,119.7 | 1,027.0 | 1,106.2 | 1,153.5 | 1,185.0 | 1,143.4 | 1,123.0 | 1,067.4 | 1,101.4 | 1,157.8 | 1,131.2 |
| Grand total 1963 | 8,718.2 | 9,005.2 | 8,700.8 | 8,349.9 | 8,538.9 | 8,811.8 | 8,820.4 | 8,851.0 | 8,697.4 | 8,635.4 | 8,723.7 | 8,715.7 | 8,712.4 |
| Pennsylvania grade (included above) | 36.8 | 34.7 | 33.1 | 31.9 | 30.6 | 36.2 | 33.2 | 30.7 | 39.4 | 33.2 | 33.6 | 37.3 | 34.2 |

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| 1964: | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 23.2 | 22.4 | 23.6 | 22.6 | 30.7 | 13.9 | 32.9 | 12.8 | 33.0 | 9.5 | 36.9 | 18.0 | 23.2 |
| Alaska | 27.5 | 33.4 | 22.7 | 28.1 | 39.6 | 28.9 | 30.2 | 29.0 | 30.7 | 26.3 | 32.9 | 27.5 | 29.6 |
| Arkansas | 73.1 | 71.8 | 75.0 | 77.9 | 73.7 | 76.4 | 74.0 | 73.6 | 70.9 | 70.6 | 73.4 | 71.7 | 73.5 |
| California | 828.4 | 809.0 | 880.5 | 800.2 | 823.1 | 845.7 | 788.2 | 832.9 | 821.8 | 824.7 | 843.5 | 790.5 | 824.0 |
| Colorado | 103.5 | 110.3 | 81.3 | 96.6 | 73.4 | 107.2 | 94.3 | 105.5 | 92.4 | 94.2 | 91.1 | 95.2 | 95.3 |
| Florida | 0.7 | | | 3.2 | | 3.6 | | 3.3 | 0.2 | 3.3 | 3.4 | | 1.5 |
| Illinois | 195.9 | 195.5 | 196.9 | 181.1 | 162.6 | 161.7 | 207.5 | 188.3 | 210.7 | 186.8 | 203.0 | 199.8 | 190.8 |
| Indiana | 32.2 | 31.5 | 29.8 | 29.0 | 34.1 | 29.9 | 29.2 | 29.3 | 34.1 | 30.1 | 28.5 | 30.7 | 30.7 |
| Kansas | 302.4 | 300.7 | 285.7 | 277.3 | 280.9 | 318.7 | 314.4 | 278.4 | 285.2 | 267.9 | 288.8 | 285.1 | 290.4 |
| Kentucky | 52.5 | 58.3 | 58.7 | 42.7 | 64.9 | 50.7 | 50.5 | 54.6 | 50.8 | 59.9 | 50.5 | 52.8 | 53.9 |
| Louisiana | 1,491.7 | 1,504.7 | 1,506.3 | 1,547.2 | 1,500.9 | 1,504.0 | 1,503.8 | 1,423.9 | 1,495.5 | 1,384.7 | 1,514.2 | 1,610.8 | 1,498.8 |
| Michigan | 51.4 | 42.6 | 39.3 | 45.1 | 33.9 | 45.8 | 44.0 | 40.7 | 45.8 | 40.8 | 43.1 | 40.0 | 42.7 |
| Mississippi | 159.7 | 149.1 | 173.6 | 145.8 | 140.9 | 159.3 | 151.4 | 150.2 | 144.3 | 164.0 | 150.9 | 162.7 | 154.4 |
| Montana | 76.7 | 88.3 | 76.7 | 83.5 | 66.9 | 99.2 | 76.1 | 83.7 | 88.2 | 90.4 | 82.0 | 93.5 | 83.7 |
| Nebraska | 67.5 | 56.7 | 60.9 | 39.6 | 46.0 | 56.9 | 48.1 | 36.4 | 55.7 | 48.4 | 59.5 | 63.7 | 53.3 |
| New Mexico | 322.0 | 327.0 | 323.9 | 313.4 | 274.3 | 329.8 | 297.5 | 337.3 | 309.6 | 310.1 | 325.3 | 343.1 | 317.7 |
| New York | 6.9 | 6.3 | 5.2 | 5.1 | 4.9 | 5.2 | 4.9 | 4.7 | 4.7 | 4.7 | 4.6 | 4.6 | 5.2 |
| North Dakota | 70.8 | 81.0 | 71.3 | 75.3 | 39.9 | 65.9 | 67.6 | 75.5 | 76.0 | 69.3 | 71.1 | 75.9 | 69.9 |
| Ohio | 33.7 | 34.8 | 34.9 | 56.7 | 47.2 | 46.1 | 41.4 | 45.5 | 44.1 | 46.4 | 41.3 | 42.2 | 42.9 |
| Oklahoma | 571.2 | 537.8 | 547.2 | 545.1 | 588.3 | 502.9 | 604.5 | 566.1 | 546.9 | 573.7 | 557.6 | 550.8 | 558.0 |
| Pennsylvania | 16.4 | 13.0 | 19.3 | 15.7 | 15.3 | 15.8 | 11.1 | 11.1 | 14.1 | 14.0 | 9.2 | 15.7 | 14.2 |
| Texas | 2,710.0 | 2,756.5 | 2,606.2 | 2,620.2 | 2,675.6 | 2,648.6 | 2,789.4 | 2,860.9 | 2,726.5 | 2,764.4 | 2,617.9 | 2,833.4 | 2,717.9 |
| Utah | 68.7 | 94.1 | 86.6 | 85.1 | 75.2 | 81.9 | 80.1 | 78.6 | 75.5 | 60.5 | 74.2 | 73.1 | 77.7 |
| West Virginia | 9.5 | 8.4 | 8.8 | 9.6 | 7.9 | 6.6 | 7.9 | 7.2 | 9.2 | 7.7 | 9.1 | 10.8 | 8.6 |
| Wyoming | 337.3 | 354.3 | 370.3 | 343.3 | 405.0 | 407.5 | 388.0 | 410.3 | 397.3 | 406.4 | 347.8 | 357.0 | 377.3 |
| Other States | 1.6 | 1.8 | 1.7 | 1.9 | 1.5 | 1.7 | 1.8 | 1.9 | 2.1 | 1.9 | 1.7 | 1.7 | [2] 1.8 |
| Total domestic crude | 7,634.5 | 7,689.3 | 7,586.4 | 7,491.3 | 7,506.7 | 7,613.9 | 7,738.8 | 7,741.7 | 7,665.3 | 7,560.7 | 7,561.5 | 7,850.3 | 7,637.0 |
| Foreign crude | 1,150.2 | 1,141.8 | 1,097.9 | 1,116.3 | 1,115.9 | 1,295.7 | 1,305.2 | 1,293.5 | 1,266.4 | 1,248.2 | 1,157.0 | 1,168.8 | 1,195.7 |
| Grand total 1964 | 8,784.7 | 8,831.1 | 8,684.3 | 8,607.6 | 8,622.6 | 8,909.6 | 9,044.0 | 9,035.2 | 8,931.7 | 8,808.9 | 8,718.5 | 9,009.1 | 8,832.7 |
| Pennsylvania grade (included above) | 38.6 | 32.4 | 39.5 | 35.0 | 32.2 | 31.5 | 28.8 | 26.2 | 32.5 | 30.5 | 27.8 | 34.5 | 32.5 |

[1] Arizona, 0.2; Missouri, 0.2; Nevada, 0.3; South Dakota, 0.6; Tennessee and Virginia less than 0.05.
[2] Arizona, 0.2; Missouri, 0.2; Nevada, 0.7; South Dakota, 0.7; Tennessee and Virginia less than 0.05.



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**TABLE 18.—Total demand for crude petroleum in the United States 1963–64 by States of origin and months**

(Thousand barrels)

| State | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| Alabama | 931 | 502 | 702 | 1,001 | 464 | 1,016 | 790 | 399 | 723 | 1,069 | 495 | 1,108 | 9,200 |
| Alaska | 1,155 | 555 | 1,003 | 645 | 993 | 779 | 680 | 1,469 | 792 | 1,022 | 834 | 1,115 | 11,042 |
| Arkansas | 2,102 | 2,188 | 2,382 | 2,126 | 2,468 | 2,281 | 2,084 | 2,570 | 2,384 | 2,358 | 2,281 | 2,287 | 27,511 |
| California | 24,832 | 21,904 | 26,212 | 23,610 | 24.489 | 24,700 | 26,811 | 25,718 | 26,141 | 25,856 | 25,396 | 25,870 | 301,539 |
| Colorado | 3,585 | 3,179 | 3,354 | 2,986 | 3,160 | 3,215 | 3,392 | 3,583 | 3,006 | 2,884 | 3,674 | 2,419 | 38,437 |
| Florida | 117 | | | 98 | | 20 | 94 | | 30 | 83 | | 89 | 531 |
| Illinois | 7,099 | 5,572 | 6,459 | 5,935 | 5,829 | 5,791 | 6,722 | 6,272 | 6,326 | 6,990 | 5,809 | 6,624 | 75,428 |
| Indiana | 1,053 | 972 | 968 | 959 | 977 | 1,126 | 1,056 | 887 | 1,002 | 1,098 | 819 | 1,061 | 11,978 |
| Kansas | 8,864 | 9,267 | 9,575 | 8,735 | 8,290 | 9,229 | 10,095 | 9,599 | 8,959 | 8,366 | 8,469 | 10,295 | 109,743 |
| Kentucky | 1,495 | 1,827 | 1,463 | 1,367 | 1,525 | 1,385 | 1,629 | 1,318 | 1,637 | 1,475 | 1,664 | 1,683 | 18,468 |
| Louisiana | 42,338 | 39,864 | 42,536 | 42,493 | 44,526 | 43,364 | 43,466 | 42,608 | 43,075 | 44,625 | 42,865 | 44,496 | 516,256 |
| Michigan | 1,380 | 1,202 | 1,383 | 1,279 | 1,392 | 1,353 | 1,388 | 1,360 | 1,304 | 1,347 | 1.174 | 1.357 | 15,919 |
| Mississippi | 4,513 | 4,902 | 4,604 | 5,042 | 5,145 | 5,106 | 4,610 | 5,072 | 4,888 | 5,008 | 5 039 | 4,872 | 58,801 |
| Montana | 2,952 | 2,343 | 2,864 | 2,292 | 2,681 | 2,737 | 3,050 | 2,743 | 2,701 | 2,475 | 2,437 | 2,800 | 32,075 |
| Nebraska | 1,886 | 1,769 | 1,915 | 1,540 | 1,767 | 2,244 | 1,874 | 1,561 | 2,000 | 1,833 | 1.741 | 1,702 | 21,832 |
| New Mexico | 9,686 | 8,618 | 9,880 | 9,069 | 8,916 | 9,748 | 9,118 | 8,694 | 8,684 | 9,086 | 9,419 | 8,899 | 109,817 |
| New York | 122 | 118 | 132 | 127 | 143 | 130 | 128 | 118 | 165 | 168 | 158 | 170 | 1,679 |
| North Dakota | 2,418 | 2,001 | 2,319 | 2,106 | 1,763 | 1,204 | 2,370 | 2,334 | 1,880 | 2,061 | 2,095 | 2,375 | 24,926 |
| Ohio | 456 | 365 | 445 | 385 | 424 | 472 | 458 | 552 | 430 | 363 | 770 | 973 | 6,093 |
| Oklahoma | 17,076 | 15,827 | 18,788 | 16,658 | 17,358 | 17,572 | 17,581 | 18,402 | 15,690 | 15,559 | 16,861 | 15,155 | 202,527 |
| Pennsylvania | 497 | 370 | 514 | 416 | 365 | 521 | 451 | 362 | 502 | 403 | 395 | 518 | 5,314 |
| Texas | 83,681 | 79,999 | 82,137 | 77,057 | 82.154 | 78,998 | 82,106 | 86,871 | 80,005 | 85,991 | 81,633 | 84,798 | 985,430 |
| Utah | 2,799 | 2,678 | 2,949 | 2,628 | 2,940 | 3,028 | 2,779 | 2,762 | 2,666 | 3,067 | 2,784 | 2,869 | 33,949 |
| West Virginia | 298 | 264 | 321 | 256 | 262 | 246 | 295 | 292 | 360 | 307 | 290 | 278 | 3.469 |
| Wyoming | 11,945 | 12,172 | 12,072 | 10,842 | 12,342 | 13,447 | 13,632 | 13,350 | 11,840 | 11,074 | 11,535 | 10,438 | 144,689 |
| Other States | 42 | 40 | 39 | 38 | 42 | 38 | 39 | 40 | 42 | 38 | 33 | 45 | [1] 476 |
| Total domestic crude | 233,322 | 218.498 | 235,016 | 219,690 | 230,415 | 229,750 | 236,698 | 238,936 | 227,232 | 234,606 | 228,670 | 234,296 | 2,767,129 |
| Foreign crude | 36.943 | 33,650 | 34,710 | 30,811 | 34,293 | 34,605 | 36,734 | 35,445 | 33,689 | 33,088 | 33,044 | 35,892 | 412,904 |
| Grand total 1963 | 270,265 | 252,148 | 269,726 | 250,501 | 264,708 | 264,355 | 273,432 | 274,381 | 260,921 | 267,694 | 261,714 | 270,188 | 3,180,033 |
| Daily average: | | | | | | | | | | | | | |
| Domestic crude | 7,527 | 7,804 | 7,581 | 7,323 | 7,433 | 7,658 | 7,635 | 7,708 | 7,574 | 7,568 | 7,622 | 7,558 | 7,581 |
| Domestic and foreign crude | 8,718 | 9,005 | 8,701 | 8,350 | 8,539 | 8,812 | 8,820 | 8,851 | 8,697 | 8,635 | 8,724 | 8,716 | 8,713 |
| Pennsylvania grade (included above) | 1,142 | 972 | 1,026 | 956 | 948 | 1,085 | 1,029 | 951 | 1,181 | 1,029 | 1,008 | 1,155 | 12,482 |

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1964: | | | | | | | | | | | | | |
| Alabama | 718 | 648 | 733 | 679 | 952 | 414 | 1,023 | 396 | 991 | 293 | 1,107 | 559 | 8,513 |
| Alaska | 853 | 967 | 703 | 842 | 1,227 | 867 | 935 | 898 | 917 | 816 | 986 | 854 | 10,865 |
| Arkansas | 2,265 | 2,083 | 2,324 | 2,339 | 2,285 | 2,291 | 2,295 | 2,282 | 2,126 | 2,188 | 2,203 | 2,223 | 26,904 |
| California | 25,681 | 23,461 | 27,296 | 24,007 | 25,513 | 25,372 | 24,433 | 25,820 | 24,655 | 25,566 | 25,305 | 24,505 | 301,614 |
| Colorado | 3,209 | 3,197 | 2,519 | 2,898 | 2,276 | 3,215 | 2,923 | 3,270 | 2,773 | 2,920 | 2,732 | 2,950 | 34,882 |
| Florida | 22 | | | 93 | | 107 | | 101 | 5 | 102 | 103 | | 533 |
| Illinois | 6,072 | 5,670 | 6,104 | 5,434 | 5,040 | 4,850 | 6,431 | 5,836 | 6,318 | 5,790 | 6,090 | 6,195 | 69,830 |
| Indiana | 999 | 914 | 922 | 871 | 1,054 | 900 | 905 | 909 | 1,024 | 933 | 854 | 952 | 11,237 |
| Kansas | 9,375 | 8,720 | 8,857 | 8,319 | 8,707 | 9,560 | 9,745 | 8,631 | 8,555 | 8,308 | 8,664 | 8,838 | 106,279 |
| Kentucky | 1,626 | 1,692 | 1,818 | 1,280 | 2,012 | 1,521 | 1,564 | 1,692 | 1,524 | 1,856 | 1,515 | 1,637 | 19,737 |
| Louisiana | 46,243 | 43,636 | 46,696 | 46,415 | 46,527 | 45,119 | 46,618 | 44,144 | 44,866 | 42,926 | 45,425 | 49,935 | 548,550 |
| Michigan | 1,592 | 1,235 | 1,218 | 1,353 | 1,051 | 1,370 | 1,365 | 1,262 | 1,375 | 1,265 | 1,292 | 1,240 | 15,618 |
| Mississippi | 4,952 | 4,324 | 5,383 | 4,375 | 4,369 | 4,779 | 4,694 | 4,657 | 4,328 | 5,086 | 4,526 | 5,045 | 56,518 |
| Montana | 2,378 | 2,560 | 2,379 | 2,504 | 2,073 | 2,977 | 2,359 | 2,594 | 2,647 | 2,802 | 2,461 | 2,897 | 30,631 |
| Nebraska | 2,092 | 1,643 | 1,889 | 1,187 | 1,427 | 1,707 | 1,491 | 1,127 | 1,671 | 1,499 | 1,788 | 1,975 | 19,494 |
| New Mexico | 9,982 | 9,484 | 10,042 | 9,402 | 8,503 | 9,895 | 9,223 | 10,456 | 9,289 | 9,615 | 9,758 | 10,633 | 116,282 |
| New York | 215 | 183 | 158 | 152 | 153 | 156 | 155 | 145 | 142 | 147 | 139 | 143 | 1,888 |
| North Dakota | 2,195 | 2,348 | 2,211 | 2,258 | 1,238 | 1,980 | 2,096 | 2,340 | 2,280 | 2,147 | 2,132 | 2,352 | 25,577 |
| Ohio | 1,044 | 1,010 | 1,083 | 1,702 | 1,464 | 1,384 | 1,282 | 1,411 | 1,324 | 1,438 | 1,239 | 1,309 | 15,690 |
| Oklahoma | 17,708 | 15,597 | 16,963 | 16,354 | 18,237 | 15,090 | 18,738 | 17,549 | 16,408 | 17,784 | 16,728 | 17,074 | 204,230 |
| Pennsylvania | 507 | 378 | 598 | 471 | 474 | 474 | 344 | 344 | 424 | 434 | 277 | 486 | 5,211 |
| Texas | 84,011 | 79,937 | 80,792 | 78,607 | 82,943 | 79,455 | 86,470 | 88,688 | 81,794 | 85,696 | 78,534 | 87,835 | 994,762 |
| Utah | 2,131 | 2,730 | 2,685 | 2,554 | 2,331 | 2,456 | 2,483 | 2,438 | 2,266 | 1,874 | 2,226 | 2,267 | 28,441 |
| West Virginia | 293 | 244 | 274 | 289 | 246 | 199 | 248 | 222 | 275 | 239 | 274 | 334 | 3,137 |
| Wyoming | 10,457 | 10,276 | 11,478 | 10,297 | 12,556 | 12,226 | 12,029 | 12,720 | 11,920 | 12,598 | 10,435 | 11,068 | 138,060 |
| Other States | 49 | 53 | 51 | 56 | 48 | 51 | 56 | 60 | 60 | 60 | 51 | 52 | [2] 647 |
| Total domestic crude | 236,669 | 222,990 | 235,176 | 224,738 | 232,706 | 228,415 | 239,905 | 239,992 | 229,957 | 234,382 | 226,842 | 243,358 | 2,795,130 |
| Foreign crude | 35,657 | 33,111 | 34,036 | 33,489 | 34,594 | 38,872 | 40,460 | 40,098 | 37,993 | 38,693 | 34,713 | 35,923 | 437,639 |
| Grand total 1964 | 272,326 | 256,101 | 269,212 | 258,227 | 267,300 | 267,287 | 280,365 | 280,090 | 267,950 | 273,075 | 261,555 | 279,281 | 3,232,769 |
| Daily average: | | | | | | | | | | | | | |
| Domestic crude | 7,634 | 7,689 | 7,586 | 7,491 | 7,507 | 7,614 | 7,739 | 7,742 | 7,665 | 7,561 | 7,561 | 7,850 | 7,637 |
| Domestic and foreign crude | 8,785 | 8,831 | 8,684 | 8,608 | 8,623 | 8,910 | 9,044 | 9,035 | 8,932 | 8,089 | 8,718 | 9,009 | 8,833 |
| Pennsylvania grade (included above) | 1,198 | 940 | 1,224 | 1,051 | 998 | 945 | 892 | 813 | 976 | 946 | 834 | 1,068 | 11,885 |

[1] Arizona, 68; Missouri, 53; Nevada, 118; South Dakota, 218; Tennessee, 16 and Virginia, 3.
[2] Arizona, 64; Missouri, 65; Nevada, 255; South Dakota, 247; Tennessee, 10, and Virginia, 6.

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## STOCKS

Refinery stocks of gasoline, kerosine, distillate fuel oil, residual fuel oil, liquefied refinery gas, miscellaneous oils, and unfinished oils are on the basis described in the 1963 Minerals Yearbook. That is, petrochemical feedstocks are treated as a separate item, whereas they formerly had been included in these other categories in instances where chemical plants were adjacent to refineries. By excluding the chemical manufacture from the regular petroleum refining, the current reporting procedure furnishes better data on the refinery products.

Stocks of all oils increased 3,676,000 barrels in 1964 and at the end of the year totaled 839,235,000 barrels. Stocks of refined products increased 9,048,000 barrels, natural gas liquids increased 1,932,000 barrels, while stocks of crude oil declined 7,304,000 barrels during the year.

**TABLE 19.—Stocks of crude petroleum, natural gas liquids, and refined products in the United States at end of year**

(Thousand barrels)

| | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Crude petroleum: | | | | | |
| At refineries | 66,450 | 64,644 | 64,836 | 61,487 | 63,908 |
| Pipeline and tank farm | 152,848 | 159,105 | 167,390 | 157,544 | 149,415 |
| Producers | 20,502 | 20,915 | 19,785 | 18,330 | 16,734 |
| Total crude petroleum | 239,800 | 244,664 | 252,011 | 237,361 | 230,057 |
| Natural gas liquids | 28,931 | 37,067 | 31,385 | 33,747 | 35,679 |
| Refined products | 515,827 | 543,343 | 550,900 | 564,451 | 573,499 |
| Grand total | 784,558 | 825,074 | 834,296 | 835,559 | 839,235 |

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**TABLE 20.—Stocks of crude petroleum in the United States by States of origin and district location, by months: 1964**

(Thousand barrels)

| State of origin | Jan. 1 | Jan. 31 | Feb. 29 | Mar. 31 | Apr. 30 | May 31 | June 30 | July 31 | Aug. 31 | Sept. 30 | Oct. 31 | Nov. 30 | Dec. 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Domestic crude: | | | | | | | | | | | | | |
| Alabama | 281 | 301 | 335 | 375 | 384 | 137 | 436 | 160 | 523 | 199 | 593 | 155 | 266 |
| Alaska | 210 | 302 | 220 | 376 | 447 | 169 | 218 | 224 | 267 | 264 | 394 | 317 | 404 |
| Arkansas | 1,111 | 1,146 | 1,219 | 1,209 | 1,072 | 1,053 | 986 | 920 | 888 | 924 | 967 | 933 | 944 |
| California | 23,428 | 22,948 | 22,888 | 20,793 | 21,386 | 21,074 | 20,303 | 21,071 | 20,452 | 20,698 | 20,933 | 20,528 | 21,823 |
| Colorado | 3,294 | 3,178 | 2,866 | 3,371 | 3,358 | 4,071 | 3,706 | 3,598 | 3,247 | 3,220 | 3,115 | 3,163 | 3,167 |
| Florida | 61 | 77 | 112 | 148 | 88 | 129 | 69 | 126 | 81 | 130 | 91 | 69 | 148 |
| Illinois | 6,430 | 6,609 | 6,659 | 6,592 | 7,081 | 7,892 | 8,902 | 8,503 | 8,480 | 7,914 | 7,878 | 7,285 | 6,768 |
| Indiana | 303 | 279 | 348 | 379 | 419 | 374 | 366 | 418 | 431 | 336 | 289 | 307 | 349 |
| Kansas | 7,571 | 7,513 | 7,384 | 7,721 | 8,323 | 8,299 | 7,306 | 6,505 | 6,627 | 6,746 | 7,441 | 7,356 | 7,544 |
| Kentucky | 1,332 | 1,505 | 1,513 | 1,534 | 1,796 | 1,445 | 1,506 | 1,583 | 1,472 | 1,550 | 1,335 | 1,382 | 1,367 |
| Louisiana | 21,424 | 22,454 | 23,344 | 23,922 | 23,682 | 22,780 | 21,637 | 20,094 | 21,025 | 20,135 | 22,284 | 23,034 | 22,572 |
| Michigan | 1,029 | 798 | 806 | 899 | 858 | 1,100 | 1,037 | 1,002 | 1,029 | 933 | 981 | 943 | 1,012 |
| Mississippi | 2,351 | 2,282 | 2,614 | 2,227 | 2,564 | 2,851 | 2,841 | 2,803 | 2,802 | 3,016 | 2,813 | 2,772 | 2,610 |
| Montana | 3,530 | 3,544 | 3,545 | 3,815 | 3,837 | 4,364 | 3,986 | 4,155 | 4,123 | 4,015 | 3,889 | 3,884 | 3,546 |
| Nebraska | 2,064 | 1,673 | 1,597 | 1,352 | 1,733 | 1,911 | 1,733 | 1,828 | 2,326 | 2,203 | 2,309 | 2,071 | 1,683 |
| New Mexico | 9,999 | 9,581 | 9,092 | 8,842 | 8,777 | 9,839 | 9,053 | 9,281 | 8,048 | 8,096 | 8,159 | 8,079 | 7,580 |
| New York | 44 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| North Dakota | 1,741 | 1,817 | 1,831 | 1,747 | 1,557 | 1,940 | 1,913 | 1,939 | 1,783 | 1,732 | 1,920 | 1,995 | 1,895 |
| Ohio | 597 | 584 | 906 | 1,171 | 880 | 812 | 744 | 842 | 763 | 835 | 761 | 790 | 766 |
| Oklahoma | 18,522 | 18,036 | 18,505 | 18,991 | 19,870 | 19,101 | 20,673 | 19,093 | 18,234 | 17,961 | 17,421 | 16,955 | 16,816 |
| Pennsylvania | 1,319 | 1,287 | 1,311 | 1,194 | 1,261 | 1,168 | 1,089 | 1,154 | 1,205 | 1,198 | 1,190 | 1,300 | 1,221 |
| South Dakota | | | | | | 1 | | | | | | | |
| Texas | 99,449 | 98,556 | 96,781 | 101,096 | 104,556 | 105,727 | 107,410 | 103,115 | 96,554 | 94,920 | 93,319 | 95,951 | 94,212 |
| Utah | 2,542 | 2,984 | 2,683 | 2,541 | 2,530 | 2,656 | 2,600 | 2,574 | 2,565 | 2,471 | 2,826 | 2,743 | 2,676 |
| West Virginia | 771 | 753 | 756 | 747 | 742 | 761 | 857 | 909 | 958 | 958 | 1,020 | 1,025 | 1,004 |
| Wyoming | 15,613 | 16,447 | 17,296 | 17,461 | 18,749 | 18,332 | 17,008 | 16,225 | 15,173 | 14,610 | 15,058 | 16,136 | 16,305 |
| Total domestic crude | 225,016 | 224,684 | 224,641 | 228,533 | 235,980 | 238,016 | 236,409 | 228,152 | 219,086 | 215,094 | 217,016 | 219,203 | 216,708 |
| Foreign crude located in districts: | | | | | | | | | | | | | |
| Districts 1–4 | 8,811 | 10,737 | 11,062 | 14,081 | 11,691 | 14,698 | 11,326 | 12,326 | 11,576 | 10,623 | 11,971 | 11,240 | 8,723 |
| District 5 | 3,534 | 5,586 | 4,359 | 4,249 | 6,241 | 4,608 | 3,495 | 5,855 | 7,250 | 7,063 | 6,246 | 6,366 | 4,626 |
| Total foreign crude | 12,345 | 16,323 | 15,421 | 18,330 | 17,932 | 19,306 | 14,821 | 18,181 | 18,826 | 17,686 | 18,217 | 17,606 | 13,349 |
| Total crude stocks | 237,361 | 241,007 | 240,062 | 246,863 | 253,912 | 257,322 | 251,230 | 246,333 | 237,912 | 232,780 | 235,233 | 236,809 | 230,057 |
| Pennsylvania grade (included above) | 2,335 | 2,257 | 2,285 | 2,179 | 2,245 | 2,176 | 2,198 | 2,300 | 2,399 | 2,382 | 2,438 | 2,547 | 2,488 |

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**TABLE 21.—Stocks of crude petroleum in the United States by location, by months: 1964**

(Thousand barrels)

| State | Jan. 1 | Jan. 31 | Feb. 29 | Mar. 31 | Apr. 30 | May 31 | June 30 | July 31 | Aug. 31 | Sept. 30 | Oct. 31 | Nov. 30 | Dec. 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 222 | 307 | 299 | 475 | 392 | 399 | 494 | 442 | 466 | 471 | 266 | 175 | 261 |
| Alaska | 208 | 301 | 220 | 264 | 327 | 169 | 218 | 224 | 267 | 264 | 394 | 317 | 404 |
| Arizona | 449 | 448 | 447 | 448 | 448 | 448 | 447 | 447 | 447 | 448 | 448 | 447 | 447 |
| Arkansas | 1,544 | 1,553 | 1,667 | 1,658 | 1,513 | 1,470 | 1,422 | 1,359 | 1,330 | 1,373 | 1,352 | 1,313 | 1,330 |
| California, Oregon, Washington | 26,886 | 28,734 | 27,372 | 25,274 | 27,766 | 25,840 | 24,071 | 27,132 | 27,424 | 28,004 | 27,399 | 26,649 | 26,779 |
| Colorado | 1,452 | 1,496 | 1,270 | 1,382 | 1,849 | 1,689 | 1,639 | 1,756 | 1,549 | 1,556 | 1,505 | 1,363 | 1,291 |
| Florida, Georgia, South Carolina, Virginia | 701 | 838 | 883 | 932 | 1,035 | 781 | 912 | 966 | 1,093 | 923 | 947 | 796 | 645 |
| Hawaii | 272 | 749 | 460 | 493 | 589 | 527 | 444 | 417 | 944 | 490 | 693 | 1,655 | 372 |
| Illinois | 14,505 | 14,301 | 15,217 | 14,927 | 15,536 | 15,873 | 16,247 | 15,860 | 15,563 | 15,497 | 15,110 | 14,725 | 13,751 |
| Indiana | 3,842 | 3,743 | 3,765 | 3,762 | 4,520 | 4,638 | 4,351 | 4,214 | 4,202 | 3,883 | 3,775 | 3,946 | 3,535 |
| Iowa, Missouri | 6,559 | 6,717 | 6,633 | 7,171 | 6,860 | 7,225 | 6,729 | 6,714 | 6,813 | 6,937 | 7,308 | 6,973 | 6,844 |
| Kansas | 9,607 | 9,826 | 9,683 | 9,797 | 10,798 | 10,649 | 10,063 | 9,843 | 9,672 | 9,492 | 9,896 | 9,725 | 9,460 |
| Kentucky, Tennessee | 3,096 | 3,517 | 3,300 | 3,426 | 3,465 | 3,369 | 3,240 | 3,572 | 3,317 | 3,208 | 3,232 | 2,937 | 2,985 |
| Louisiana | 14,208 | 15,388 | 15,184 | 15,926 | 16,620 | 16,193 | 14,743 | 13,498 | 14,018 | 13,997 | 14,572 | 14,647 | 15,004 |
| Maryland | 239 | 305 | 494 | 532 | 557 | 383 | 525 | 433 | 510 | 348 | 322 | 323 | 199 |
| Massachusetts, Delaware, Rhode Island | 691 | 1,041 | 996 | 959 | 581 | 1,155 | 591 | 861 | 881 | 1,214 | 1,205 | 1,114 | 788 |
| Michigan | 1,809 | 1,789 | 1,747 | 2,015 | 1,933 | 2,210 | 2,187 | 2,105 | 2,099 | 1,897 | 1,973 | 1,879 | 1,900 |
| Minnesota, Wisconsin | 2,432 | 2,101 | 2,145 | 1,918 | 1,890 | 2,371 | 2,589 | 2,118 | 1,999 | 1,778 | 1,882 | 2,019 | 2,055 |
| Mississippi | 2,289 | 2,292 | 2,104 | 2,380 | 2,480 | 2,402 | 2,138 | 2,176 | 2,341 | 2,172 | 2,489 | 2,697 | 2,723 |
| Montana | 1,959 | 1,981 | 2,196 | 2,213 | 2,403 | 2,295 | 2,387 | 2,253 | 2,266 | 2,157 | 2,083 | 2,087 | 1,821 |
| Nebraska | 1,787 | 1,702 | 1,751 | 1,800 | 1,849 | 1,807 | 1,802 | 1,859 | 1,746 | 1,817 | 1,782 | 1,753 | 1,737 |
| New Jersey | 4,168 | 4,843 | 4,866 | 6,323 | 4,950 | 6,271 | 5,170 | 5,987 | 4,639 | 5,544 | 5,481 | 6,340 | 5,375 |
| New Mexico | 3,686 | 3,641 | 3,892 | 3,656 | 3,851 | 3,630 | 3,558 | 3,393 | 3,267 | 3,670 | 3,808 | 3,696 | 3,497 |
| New York | 1,115 | 821 | 777 | 1,082 | 862 | 1,191 | 1,176 | 1,035 | 973 | 991 | 1,017 | 1,077 | 890 |
| North Dakota | 1,189 | 1,367 | 1,435 | 1,294 | 1,216 | 1,556 | 1,404 | 1,361 | 1,265 | 1,357 | 1,426 | 1,418 | 1,366 |
| Ohio | 6,728 | 6,782 | 7,045 | 7,385 | 6,777 | 7,498 | 7,256 | 7,248 | 7,372 | 7,185 | 6,840 | 7,134 | 6,752 |
| Oklahoma | 20,778 | 19,397 | 18,683 | 18,867 | 19,535 | 20,780 | 22,230 | 20,353 | 18,251 | 17,687 | 17,072 | 17,605 | 17,645 |
| Pennsylvania | 9,498 | 9,668 | 9,213 | 10,933 | 8,969 | 8,747 | 8,578 | 8,960 | 10,210 | 8,910 | 11,196 | 10,418 | 8,961 |
| South Dakota | | | | | | 1 | | | | | | | |
| Texas | 85,839 | 86,057 | 86,774 | 89,841 | 93,638 | 94,281 | 94,563 | 90,367 | 84,320 | 81,447 | 80,688 | 82,080 | 80,764 |
| Utah | 1,102 | 1,040 | 1,230 | 1,075 | 1,046 | 1,158 | 1,116 | 1,067 | 1,137 | 1,088 | 1,042 | 1,291 | 1,368 |
| West Virginia | 602 | 599 | 558 | 575 | 619 | 605 | 646 | 682 | 706 | 737 | 749 | 701 | 690 |
| Wyoming | 7,899 | 7,663 | 7,756 | 8,080 | 9,038 | 9,711 | 8,294 | 7,631 | 6,825 | 6,238 | 7,281 | 8,109 | 8,418 |
| Total | 237,361 | 241,007 | 240,062 | 246,863 | 253,912 | 257,322 | 251,230 | 246,333 | 237,912 | 232,780 | 235,233 | 236,809 | 230,057 |

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**TABLE 22.—Stocks of crude petroleum in the United States by classification and location, by months: 1964**

(Thousand barrels)

| Classification and location | Jan. 1 | Jan. 31 | Feb. 29 | Mar. 31 | Apr. 30 | May 31 | June 30 | July 31 | Aug. 31 | Sept. 30 | Oct. 31 | Nov. 30 | Dec. 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| At refineries: | | | | | | | | | | | | | |
| Alabama | 157 | 242 | 256 | 332 | 311 | 337 | 422 | 367 | 399 | 389 | 210 | 124 | 197 |
| Alaska | 46 | 44 | 86 | 59 | 50 | 56 | 58 | 49 | 80 | 77 | 73 | 45 | 78 |
| Arkansas | 413 | 422 | 572 | 586 | 478 | 470 | 404 | 381 | 339 | 346 | 276 | 249 | 262 |
| California, Oregon, Washington | 12,319 | 14,258 | 13,682 | 13,157 | 15,403 | 13,721 | 12,660 | 15,331 | 16,000 | 16,251 | 16,489 | 16,150 | 14,907 |
| Colorado | 230 | 307 | 230 | 179 | 419 | 193 | 215 | 262 | 209 | 197 | 268 | 188 | 200 |
| Florida, Georgia, South Carolina, Virginia | 662 | 761 | 771 | 878 | 947 | 759 | 843 | 941 | 1,012 | 896 | 856 | 727 | 593 |
| Hawaii | 272 | 749 | 460 | 493 | 589 | 527 | 444 | 417 | 944 | 490 | 693 | 1,055 | 372 |
| Illinois | 3,353 | 3,340 | 3,308 | 3,468 | 3,460 | 3,461 | 3,528 | 3,747 | 3,379 | 3,312 | 3,274 | 3,057 | 2,792 |
| Indiana | 1,315 | 1,338 | 1,124 | 1,217 | 1,377 | 1,429 | 988 | 985 | 973 | 1,055 | 1,103 | 1,236 | 1,100 |
| Kansas | 1,497 | 1,555 | 1,419 | 1,588 | 1,943 | 1,772 | 1,586 | 1,455 | 1,563 | 1,636 | 1,635 | 1,521 | 1,432 |
| Kentucky, Tennessee | 1,095 | 1,346 | 1,103 | 1,217 | 1,283 | 1,151 | 1,190 | 1,394 | 1,273 | 1,122 | 1,202 | 948 | 1,008 |
| Louisiana | 3,659 | 4,224 | 4,266 | 4,096 | 4,992 | 5,044 | 3,834 | 3,649 | 3,834 | 4,225 | 4,303 | 4,396 | 4,243 |
| Maryland | 239 | 305 | 494 | 532 | 557 | 383 | 525 | 433 | 510 | 348 | 322 | 323 | 199 |
| Massachusetts, Delaware, Rhode Island | 691 | 1,041 | 996 | 959 | 581 | 1,155 | 591 | 861 | 881 | 1,214 | 1,205 | 1,114 | 788 |
| Michigan | 815 | 825 | 941 | 943 | 1,084 | 945 | 1,014 | 894 | 927 | 858 | 821 | 768 | 806 |
| Minnesota, Wisconsin | 1,656 | 1,467 | 1,571 | 1,315 | 1,341 | 1,713 | 1,886 | 1,532 | 1,382 | 1,184 | 1,296 | 1,425 | 1,449 |
| Mississippi | 534 | 486 | 526 | 719 | 697 | 522 | 465 | 523 | 661 | 483 | 698 | 807 | 1,012 |
| Missouri | 188 | 279 | 225 | 331 | 234 | 275 | 274 | 265 | 265 | 266 | 270 | 247 | 283 |
| Montana | 517 | 622 | 708 | 660 | 820 | 689 | 747 | 737 | 704 | 666 | 612 | 603 | 484 |
| Nebraska | 29 | 32 | 28 | 20 | 27 | 26 | 25 | 30 | 30 | 34 | 31 | 21 | 36 |
| New Jersey | 4,168 | 4,843 | 4,866 | 6,323 | 4,950 | 6,271 | 5,170 | 5,987 | 4,639 | 5,544 | 5,481 | 6,340 | 5,375 |
| New Mexico | 217 | 240 | 231 | 218 | 225 | 219 | 148 | 127 | 157 | 188 | 200 | 218 | 221 |
| New York | 633 | 392 | 419 | 665 | 550 | 695 | 727 | 640 | 493 | 624 | 653 | 711 | 584 |
| North Dakota | 210 | 251 | 285 | 237 | 135 | 368 | 248 | 215 | 213 | 244 | 282 | 232 | 238 |
| Ohio | 1,978 | 1,893 | 2,127 | 2,120 | 1,823 | 2,369 | 2,097 | 2,049 | 1,842 | 1,953 | 1,741 | 1,941 | 1,848 |
| Oklahoma | 2,262 | 2,213 | 2,106 | 2,226 | 2,050 | 2,110 | 2,393 | 2,479 | 2,200 | 2,149 | 2,219 | 1,984 | 1,592 |
| Pennsylvania | 7,839 | 8,041 | 7,584 | 9,406 | 7,497 | 7,255 | 7,005 | 7,382 | 8,508 | 7,312 | 9,520 | 8,640 | 7,176 |
| Texas | 13,414 | 13,736 | 15,372 | 15,805 | 16,240 | 16,125 | 16,142 | 15,044 | 15,031 | 14,075 | 14,936 | 14,519 | 13,449 |
| Utah | 422 | 408 | 534 | 464 | 369 | 493 | 475 | 409 | 432 | 395 | 412 | 555 | 540 |
| West Virginia | 47 | 50 | 43 | 43 | 49 | 33 | 38 | 44 | 58 | 68 | 80 | 69 | 71 |
| Wyoming | 610 | 566 | 589 | 499 | 879 | 802 | 717 | 585 | 548 | 449 | 507 | 497 | 573 |
| Total at refineries | 61,487 | 66,276 | 66,922 | 70,755 | 71,360 | 71,368 | 66,859 | 69,214 | 69,486 | 68,050 | 71,668 | 70,710 | 63,908 |

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## TABLE 22.—Stocks of crude petroleum in the United States by classification and location, by months: 1964—Continued

(Thousand barrels)

| Classification and location | Jan. 1 | Jan. 31 | Feb. 29 | Mar. 31 | Apr. 30 | May 31 | June 30 | July 31 | Aug. 31 | Sept. 30 | Oct. 31 | Nov. 30 | Dec. 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipeline and tank-farm stocks: | | | | | | | | | | | | | |
| Alabama | 52 | 56 | 29 | 129 | 52 | 33 | 41 | 46 | 38 | 62 | 36 | 32 | 43 |
| Alaska | 159 | 253 | 131 | 202 | 273 | 109 | 156 | 171 | 184 | 184 | 317 | 267 | 322 |
| Arkansas | 1,028 | 1,032 | 1,000 | 980 | 944 | 913 | 937 | 892 | 895 | 932 | 980 | 965 | 979 |
| California, Arizona | 12,706 | 13,090 | 12,322 | 10,760 | 11,007 | 10,749 | 10,032 | 10,463 | 10,113 | 10,439 | 9,585 | 9,249 | 11,086 |
| Colorado | 1,123 | 1,084 | 935 | 1,098 | 1,325 | 1,391 | 1,319 | 1,380 | 1,226 | 1,245 | 1,123 | 1,042 | 958 |
| Florida | 32 | 71 | 103 | 45 | 79 | 14 | 58 | 16 | 72 | 22 | 88 | 62 | 45 |
| Illinois | 10,705 | 10,520 | 11,459 | 11,018 | 11,635 | 11,919 | 12,254 | 11,663 | 11,709 | 11,728 | 11,379 | 11,198 | 10,489 |
| Indiana | 2,497 | 2,375 | 2,611 | 2,515 | 3,113 | 3,179 | 3,333 | 3,199 | 3,199 | 2,798 | 2,642 | 2,680 | 2,405 |
| Iowa, Missouri | 6,371 | 6,438 | 6,408 | 6,840 | 6,626 | 6,950 | 6,455 | 6,449 | 6,548 | 6,671 | 7,038 | 6,726 | 6,561 |
| Kansas | 7,550 | 7,773 | 7,749 | 7,687 | 8,333 | 8,315 | 7,963 | 7,884 | 7,595 | 7,365 | 7,764 | 7,652 | 7,525 |
| Kentucky, Tennessee | 1,936 | 2,106 | 2,132 | 2,144 | 2,117 | 2,153 | 1,985 | 2,113 | 1,979 | 2,021 | 1,965 | 1,924 | 1,912 |
| Louisiana | 8,297 | 8,976 | 8,696 | 9,663 | 9,461 | 9,061 | 8,787 | 7,754 | 7,985 | 7,600 | 8,060 | 7,983 | 8,430 |
| Michigan | 824 | 794 | 636 | 902 | 679 | 1,080 | 988 | 1,026 | 987 | 854 | 967 | 926 | 909 |
| Minnesota, Wisconsin | 776 | 634 | 574 | 603 | 549 | 658 | 703 | 586 | 617 | 594 | 586 | 594 | 606 |
| Mississippi | 1,402 | 1,426 | 1,198 | 1,281 | 1,423 | 1,498 | 1,309 | 1,300 | 1,314 | 1,350 | 1,429 | 1,505 | 1,378 |
| Montana | 1,095 | 1,030 | 1,140 | 1,188 | 1,218 | 1,232 | 1,275 | 1,174 | 1,220 | 1,157 | 1,120 | 1,127 | 980 |
| Nebraska | 1,649 | 1,561 | 1,608 | 1,665 | 1,707 | 1,666 | 1,662 | 1,714 | 1,601 | 1,668 | 1,636 | 1,617 | 1,586 |
| New Mexico | 2,390 | 2,322 | 2,557 | 2,373 | 2,546 | 2,284 | 2,318 | 2,161 | 1,982 | 2,389 | 2,495 | 2,334 | 2,132 |
| New York | 452 | 399 | 328 | 387 | 282 | 466 | 419 | 365 | 450 | 337 | 334 | 336 | 276 |
| North Dakota | 798 | 926 | 957 | 842 | 902 | 962 | 938 | 930 | 853 | 915 | 979 | 1,006 | 944 |
| Ohio | 4,670 | 4,809 | 4,838 | 5,185 | 4,874 | 5,049 | 5,079 | 5,119 | 5,450 | 5,152 | 5,019 | 5,113 | 4,824 |
| Oklahoma | 17,065 | 15,775 | 15,175 | 15,239 | 16,119 | 17,255 | 18,416 | 16,423 | 14,625 | 14,158 | 13,461 | 14,237 | 14,722 |
| Pennsylvania | 1,509 | 1,477 | 1,479 | 1,377 | 1,322 | 1,342 | 1,423 | 1,428 | 1,552 | 1,448 | 1,526 | 1,628 | 1,635 |
| Texas | 64,672 | 64,848 | 63,900 | 66,583 | 70,198 | 70,613 | 71,114 | 68,033 | 61,741 | 60,061 | 58,301 | 59,933 | 60,182 |
| Utah | 613 | 556 | 614 | 545 | 607 | 608 | 574 | 588 | 628 | 628 | 561 | 664 | 739 |
| West Virginia | 390 | 384 | 350 | 367 | 405 | 407 | 443 | 473 | 483 | 504 | 504 | 467 | 454 |
| Wyoming | 6,783 | 6,579 | 6,649 | 7,069 | 7,633 | 8,355 | 7,031 | 6,510 | 5,741 | 5,253 | 6,230 | 7,051 | 7,293 |
| Total pipeline and tank-farm stocks | 157,544 | 157,294 | 155,578 | 158,687 | 165,429 | 168,261 | 167,012 | 159,860 | 150,787 | 147,535 | 146,125 | 148,318 | 149,415 |
| Lease stocks | 18,330 | 17,437 | 17,562 | 17,421 | 17,123 | 17,693 | 17,359 | 17,259 | 17,639 | 17,195 | 17,440 | 17,781 | 16,734 |
| Total stocks: 1964 | 237,361 | 241,067 | 240,062 | 246,863 | 253,912 | 257,322 | 251,230 | 246,333 | 237,912 | 232,780 | 235,233 | 236,809 | 230,057 |
| 1963 | 252,011 | 249,209 | 240,396 | 241,029 | 251,391 | 255,666 | 250,036 | 249,962 | 249,077 | 248,261 | 245,539 | 244,387 | 237,361 |

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## STORAGE CAPACITY

The Bureau of Mines conducts semiannual surveys of petroleum refineries, bulk terminals, and underground storage facilities to ascertain the capacity assigned to the storage of gasoline, kerosine, distillate fuel oil, residual fuel oil, military jet fuel, and liquefied petroleum gases. Liquefied gases require special storage facilities, the bulk being underground caverns. Tanks for storing residual fuel oil can also be used for crude oil. Storage for the other products is interchangeable depending on demand.

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**TABLE 23.—Capacity of storage tanks for finished petroleum products and capacity of underground storage facilities for liquefied gases, at refineries, gasoline plants, bulk terminals [1] and tank farms**

(Thousand barrels)

| Refinery district and date | Gasoline | | | Kerosine | | | Distillate fuel oil | | | Residual fuel oil | | | Military jet fuel | | | Liquefied petroleum gases | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | Aboveground | | Underground | |
| | At refineries | At bulk terminals | Total | At refineries | At bulk terminals | Total | At refineries | At bulk terminals | Total | At refineries | At bulk terminals | Total | At refineries | At bulk terminals | Total | At plants and terminals | At refineries | At plants, terminals and refineries | Total |
| 1963: | | | | | | | | | | | | | | | | | | | |
| East Coast: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 25,750 | 59,522 | 85,272 | 3,816 | 18,988 | 22,804 | 21,755 | 71,280 | 93,035 | 7,259 | 17,738 | 24,997 | 476 | 665 | 1,141 | [3] 329 | [3] 252 | [3] 1,982 | [3] 2,563 |
| Oct. 1 | 22,572 | 58,441 | 81,013 | 4,078 | 19,372 | 23,450 | 25,096 | 73,712 | 98,808 | 7,847 | 17,372 | 25,219 | 470 | 432 | 902 | [3] 329 | [3] 231 | [3] 2,157 | [3] 2,717 |
| Appalachian No. 1: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 2,734 | 6,597 | 9,331 | 280 | 967 | 1,247 | 1,334 | 4,368 | 5,702 | 564 | 393 | 957 | 40 | ------- | 40 | (3) | (3) | (3) | (3) |
| Oct. 1 | 2,327 | 6,317 | 8,644 | 282 | 952 | 1,234 | 1,414 | 4,012 | 5,426 | 535 | 226 | 761 | 87 | ------- | 87 | (3) | (3) | (3) | (3) |
| Appalachian No. 2: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 1,517 | 4,539 | 6,056 | 209 | 693 | 902 | 487 | 2,225 | 2,712 | 404 | 67 | 471 | 27 | 169 | 196 | (3) | (3) | (3) | (3) |
| Oct. 1 | 1,311 | 4,592 | 5,903 | 261 | 758 | 1,019 | 598 | 2,361 | 2,959 | 464 | 67 | 531 | 27 | 169 | 196 | (3) | (3) | (3) | (3) |
| Indiana, Illinois, Kentucky, etc.: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 40,366 | 27,282 | 67,648 | 5,421 | 4,987 | 10,408 | 19,019 | 20,270 | 39,289 | 9,334 | 1,703 | 11,037 | 1,613 | 697 | 2,310 | [3] 471 | [3] 787 | [3] 4,712 | [3] 5,970 |
| Oct. 1 | 35,585 | 26,572 | 62,157 | 6,325 | 5,264 | 11,589 | 26,119 | 20,044 | 46,163 | 10,213 | 1,252 | 11,465 | 1,420 | 611 | 2,031 | [3] 495 | [3] 754 | [3] 4,385 | [3] 5,634 |
| Minnesota, Wisconsin, North and South Dakota: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 3,950 | 10,365 | 14,315 | 586 | 2,193 | 2,779 | 2,245 | 9,870 | 12,115 | 1,164 | 327 | 1,491 | 202 | 63 | 265 | (4) | (4) | (4) | (4) |
| Oct. 1 | 3,832 | 9,725 | 13,557 | 825 | 2,362 | 3,187 | 2,435 | 10,328 | 12,763 | 1,139 | 185 | 1,324 | 258 | 41 | 299 | (4) | (4) | (4) | (4) |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oklahoma, Kansas, Missouri, etc.: | | | | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 19,184 | 13,846 | 32,500 | 1,886 | 1,008 | 2,894 | 10,797 | 8,648 | 19,445 | 1,952 | 21 | 1,973 | 1,441 | 361 | 1,802 | [4] 695 | [4] 711 | [10,108] | [5] 11,574 |
| Oct. 1 | 13,047 | 12,828 | 30,875 | 1,996 | 1,046 | 3,032 | 11,897 | 9,357 | 20,964 | 1,875 | 21 | 1,896 | 1,357 | 321 | 1,708 | [4] 749 | [4] 722 | [11,623] | [5] 13,094 |
| Texas Inland: | | | | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 11,195 | 5,316 | 16,511 | 653 | 792 | 1,445 | 3,001 | 1,156 | 4,157 | 1,051 | ------ | 1,051 | 1,126 | 404 | 1,530 | 2,105 | [4] 674 | 14,684 | 17,463 |
| Oct. 1 | 10,978 | 6,683 | 16,571 | 632 | 813 | 1,445 | 3,398 | 1,238 | 4,619 | 1,011 | ------ | 1,011 | 1,049 | 366 | 1,403 | 1,964 | [4] 670 | 14,426 | 17,060 |
| Texas Gulf Coast: | | | | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 43,359 | 6,906 | 50,265 | 5,889 | 809 | 6,498 | 21,537 | 3,070 | 24,607 | 7,162 | 236 | 7,398 | 3,457 | ------ | 3,457 | 628 | 971 | 27,791 | 29,390 |
| Oct. 1 | 41,222 | 6,347 | 47,479 | 6,205 | 1,267 | 7,472 | 23,465 | 3,696 | 29,161 | 7,367 | 236 | 7,603 | 2,943 | ------ | 2,943 | 641 | 961 | 27,383 | 28,985 |
| Louisiana Gulf Coast: | | | | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 18,041 | 3,726 | 21,767 | 2,717 | 726 | 3,443 | 7,281 | 1,639 | 8,920 | 1,138 | 550 | 1,688 | 1,845 | ------ | 1,845 | 320 | [4] 324 | 6,849 | 7,493 |
| Oct. 1 | 18,459 | 3,657 | 22,116 | 3,568 | 732 | 4,300 | 9,646 | 1,569 | 11,415 | 2,290 | 366 | 2,656 | 1,947 | ------ | 1,947 | 388 | [4] 394 | 6,494 | 7,266 |
| Arkansas, Louisiana Inland, etc.: | | | | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 2,250 | 7,747 | 9,997 | 329 | 813 | 1,142 | 1,090 | 1,922 | 3,012 | 800 | 10 | 810 | 120 | 265 | 385 | 232 | (6) | 4,642 | 4,874 |
| Oct. 1 | 2,726 | 7,594 | 10,310 | 464 | 878 | 1,342 | 981 | 2,142 | 3,123 | 321 | ------ | 321 | 127 | 345 | 472 | 212 | (6) | 4,611 | 4,723 |
| New Mexico: | | | | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 515 | 437 | 952 | 67 | 42 | 109 | 128 | 161 | 289 | 230 | ------ | 230 | 137 | 60 | 197 | 229 | (6) | 1,274 | 1,503 |
| Oct. 1 | 526 | 436 | 962 | 68 | 42 | 110 | 129 | 160 | 289 | 41 | ------ | 41 | 193 | 60 | 253 | 246 | (6) | 1,263 | 1,509 |
| Rocky Mountain: | | | | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 9,646 | 2,683 | 12,329 | 476 | 182 | 658 | 3,560 | 1,645 | 5,205 | 1,892 | 2 | 1,894 | 960 | 93 | 1,053 | 201 | 96 | 274 | 570 |
| Oct. 1 | 9,288 | 2,612 | 11,900 | 780 | 117 | 897 | 3,909 | 1,685 | 5,594 | 1,903 | 2 | 1,905 | 970 | 135 | 1,106 | 216 | 98 | 319 | 633 |
| West Coast: | | | | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 40,047 | 17,095 | 57,142 | 3,554 | 1,957 | 5,511 | 18,273 | 11,832 | 30,105 | 17,915 | 12,718 | 30,633 | 2,689 | 119 | 2,808 | 96 | 922 | 850 | 1,868 |
| Oct. 1 | 40,050 | 17,049 | 57,099 | 3,487 | 1,977 | 5,464 | 18,942 | 11,497 | 30,439 | 17,996 | 12,479 | 30,475 | 3,649 | 168 | 3,817 | 80 | 784 | 850 | 1,714 |
| United States: | | | | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 218,524 | 165,561 | 384,085 | 25,283 | 34,157 | 59,440 | 110,507 | 138,086 | 248,593 | 50,355 | 33,785 | 84,130 | 14,133 | 2,896 | 17,029 | 5,306 | 4,736 | 73,226 | 83,268 |
| Oct. 1 | 206,933 | 161,653 | 368,586 | 28,961 | 35,580 | 64,541 | 129,917 | 141,796 | 271,713 | 53,002 | 32,206 | 85,208 | 14,527 | 2,638 | 17,165 | 5,320 | 4,614 | 72,401 | 83,335 |

See footnotes at end of table.

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**TABLE 23.—Capacity of storage tanks for finished petroleum products and capacity of underground storage facilities for liquefied gases, at refineries, gasoline plants, bulk terminals [1] and tank farms—Continued**

(Thousand barrels)

| Refinery district and date | Gasoline | | | Kerosine | | | Distillate fuel oil | | | Residual fuel oil | | | Military jet fuel | | | Liquefied petroleum gases | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | Aboveground | | Underground | |
| | At refineries | At bulk terminals | Total | At refineries | At bulk terminals | Total | At refineries | At bulk terminals | Total | At refineries | At bulk terminals | Total | At refineries | At bulk terminals | Total | At plants and terminals | At refineries | At plants, terminals and refineries | Total |
| 1964: | | | | | | | | | | | | | | | | | | | |
| East Coast: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 25,629 | 59,794 | 85,423 | 3,812 | 19,541 | 23,353 | 21,796 | 72,899 | 94,695 | 7,379 | 17,084 | 24,463 | 470 | 399 | 869 | [2] 329 | [2] 230 | [2] 2,157 | [2] 2,716 |
| Oct. 1 | 22,740 | 58,450 | 81,190 | 3,751 | 19,331 | 23,082 | 25,140 | 74,056 | 99,196 | 7,042 | 17,812 | 24,854 | 465 | 312 | 777 | [2] 362 | [2] 216 | [2] 2,466 | [2] 3,044 |
| Appalachian No. 1: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 2,503 | 6,313 | 8,816 | 296 | 1,006 | 1,302 | 1,251 | 4,005 | 5,256 | 588 | 233 | 821 | 50 | ------- | 50 | (3) | (3) | (3) | (3) |
| Oct. 1 | 2,280 | 6,835 | 9,115 | 256 | 1,051 | 1,307 | 1,788 | 4,446 | 6,234 | 553 | 232 | 785 | 23 | ------- | 23 | (3) | (3) | (3) | (3) |
| Appalachian No. 2: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 1,465 | 5,009 | 6,474 | 251 | 696 | 947 | 439 | 2,264 | 2,703 | 398 | 67 | 465 | 27 | 169 | 196 | (3) | (3) | (3) | (3) |
| Oct. 1 | 1,411 | 4,758 | 6,169 | 251 | 786 | 1,037 | 596 | 2,560 | 3,156 | 387 | 67 | 454 | 27 | 169 | 196 | (3) | (3) | (3) | (3) |
| Indiana, Illinois, Kentucky, etc.: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 40,942 | 27,954 | 68,896 | 5,629 | 5,690 | 11,319 | 19,759 | 19,729 | 39,488 | 9,598 | 1,792 | 11,390 | 1,583 | 777 | 2,360 | [2] 508 | [2] 726 | [2] 4,592 | [2] 5,826 |
| Oct. 1 | 35,974 | 27,017 | 62,991 | 6,447 | 5,415 | 11,862 | 24,223 | 20,795 | 45,018 | 10,155 | 2,033 | 12,188 | 1,512 | 749 | 2,261 | [2] 506 | [2] 712 | [2] 5,785 | [2] 7,003 |
| Minnesota, Wisconsin, North and South Dakota: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 4,031 | 10,123 | 14,154 | 612 | 1,787 | 2,399 | 2,439 | 10,347 | 12,786 | 1,234 | 182 | 1,416 | 260 | 117 | 377 | (4) | (4) | (4) | (4) |
| Oct. 1 | 3,819 | 9,756 | 13,575 | 615 | 2,017 | 2,632 | 3,016 | 10,710 | 13,726 | 1,167 | 182 | 1,349 | 270 | 115 | 385 | (4) | (4) | (4) | (4) |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oklahoma, Kansas, Missouri, etc.: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 19,205 | 13,609 | 32,814 | 1,366 | 944 | 2,310 | 10,131 | 8,800 | 18,931 | 2,380 | 21 | 2,401 | 1,480 | 286 | 1,706 | [4]806 | [4]727 | [4]12,096 | [4]13,629 |
| Oct. 1 | 17,708 | 12,721 | 30,429 | 1,482 | 943 | 2,425 | 12,190 | 9,743 | 21,933 | 2,439 | 253 | 2,692 | 1,819 | 428 | 2,247 | [4]873 | [4]730 | [4]13,748 | [4]15,351 |
| Texas Inland: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 10,729 | 5,558 | 16,287 | 530 | 872 | 1,402 | 3,087 | 1,237 | 4,324 | 932 | ------- | 932 | 1,083 | 420 | 1,503 | 2,077 | [4]676 | 14,633 | 17,386 |
| Oct. 1 | 8,499 | 5,516 | 14,015 | 546 | 943 | 1,489 | 3,625 | 1,266 | 4,891 | 865 | ------- | 865 | 1,073 | 433 | 1,506 | 2,167 | [4]612 | 14,130 | 16,909 |
| Texas Gulf Coast: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 45,256 | 7,898 | 53,154 | 6,318 | 1,635 | 7,953 | 22,693 | 3,839 | 26,532 | 7,426 | 236 | 7,662 | 2,518 | ------- | 2,518 | 646 | 984 | 29,458 | 31,088 |
| Oct. 1 | 40,722 | 7,741 | 48,463 | 6,999 | 1,413 | 8,412 | 26,656 | 4,645 | 31,301 | 7,630 | 236 | 7,866 | 2,518 | 1 | 2,519 | 528 | 899 | 31,381 | 32,808 |
| Louisiana Gulf Coast: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 17,922 | 3,556 | 21,478 | 3,135 | 753 | 3,888 | 7,941 | 1,555 | 9,496 | 2,265 | 372 | 2,637 | 2,003 | 105 | 2,108 | 361 | [4]384 | 7,100 | 7,845 |
| Oct. 1 | 17,863 | 4,953 | 22,816 | 3,576 | 858 | 4,434 | 9,193 | 2,374 | 11,567 | 1,920 | 290 | 2,210 | 1,639 | 105 | 1,744 | 376 | [4]384 | 6,863 | 7,623 |
| Arkansas, Louisiana Inland, etc.: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 2,212 | 8,152 | 10,364 | 464 | 1,049 | 1,513 | 1,128 | 2,274 | 3,402 | 328 | ------- | 328 | 224 | 425 | 649 | 209 | ([6]) | 4,622 | 4,831 |
| Oct. 1 | 2,214 | 8,171 | 10,385 | 462 | 903 | 1,365 | 1,159 | 2,501 | 3,660 | 401 | ------- | 401 | 133 | 265 | 398 | 238 | ([6]) | 4,663 | 4,901 |
| New Mexico: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 481 | 472 | 953 | 44 | 53 | 97 | 108 | 151 | 259 | 40 | ------- | 40 | 198 | 60 | 258 | 246 | ([5]) | 1,265 | 1,511 |
| Oct. 1 | 539 | 472 | 1,011 | 46 | 53 | 99 | 175 | 151 | 326 | 61 | ------- | 61 | 198 | 60 | 258 | 245 | ([5]) | 1,265 | 1,510 |
| Rocky Mountain: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 10,198 | 2,751 | 12,949 | 526 | 117 | 643 | 3,660 | 1,806 | 5,466 | 1,898 | 2 | 1,900 | 738 | 167 | 905 | 212 | 98 | 460 | 770 |
| Oct. 1 | 9,489 | 3,093 | 12,582 | 742 | 167 | 909 | 3,646 | 2,090 | 5,736 | 1,914 | 2 | 1,916 | 962 | 125 | 1,087 | 223 | 98 | 479 | 800 |
| West Coast: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 39,097 | 17,470 | 56,567 | 3,525 | 2,013 | 5,538 | 18,542 | 11,402 | 29,944 | 17,828 | 12,484 | 30,312 | 4,026 | 468 | 4,494 | 82 | 752 | 850 | 1,684 |
| Oct. 1 | 38,379 | 17,587 | 55,966 | 3,209 | 2,529 | 5,738 | 19,319 | 12,156 | 31,475 | 17,820 | 9,677 | 27,497 | 3,868 | 521 | 4,389 | 82 | 770 | 850 | 1,702 |
| United States: | | | | | | | | | | | | | | | | | | | |
| Apr. 1 | 219,670 | 168,659 | 388,329 | 26,508 | 36,156 | 62,664 | 112,974 | 140,308 | 253,282 | 52,294 | 32,473 | 84,767 | 14,660 | 3,393 | 18,053 | 5,476 | 4,577 | 77,233 | 87,286 |
| Oct. 1 | 201,637 | 167,070 | 368,707 | 28,382 | 36,409 | 64,791 | 130,726 | 147,493 | 278,219 | 52,354 | 30,784 | 83,138 | 14,507 | 3,283 | 17,790 | 5,600 | 4,421 | 81,630 | 91,651 |

[1] Includes only bulk terminals operated by refinery and pipeline companies.
[2] Figures for Appalachian No. 1 included with those for East Coast.
[3] Figures for Appalachian No. 2 included with those for Indiana, Illinois, etc.
[4] Figures for Minnesota, Wisconsin, etc. included with those for Oklahoma, Kansas, etc.
[5] Figures for New Mexico included with those for Texas Inland.
[6] Figures for Arkansas, Louisiana Inland, etc. included with those for Louisiana Gulf.

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## VALUE AND PRICE

The total value of crude oil produced in the United States in 1964 was $8,017,078,000, which is an average wellhead price of $2.88 per barrel. The price at the well in 1963 was $2.89.

**TABLE 24.—Value of crude petroleum at wells in the United States, by States**

| State | 1963 | | 1964 | |
|---|---|---|---|---|
| | Total value at wells (thousand dollars) | Average value per barrel | Total value at wells (thousand dollars) | Average value per barrel |
| Alabama | 23,763 | $2.59 | 22,095 | $2.60 |
| Alaska | 32,650 | 3.04 | 33,627 | 3.04 |
| Arkansas | 72,900 | 2.66 | 71,120 | 2.66 |
| California | 746,252 | 2.48 | 729,022 | 2.43 |
| Colorado | 110,255 | 2.88 | 100,094 | 2.88 |
| Illinois | 222,892 | 2.98 | 205,592 | 2.93 |
| Indiana | 35,230 | 2.96 | 32,157 | 2.85 |
| Kansas | 317,501 | 2.91 | 310,256 | 2.92 |
| Kentucky | 53,564 | 2.92 | 56,746 | 2.87 |
| Louisiana: | | | | |
| Gulf Coast | 1,455,297 | 3.13 | 1,548,052 | 3.12 |
| Northern | 152,823 | 3.05 | 161,570 | 3.01 |
| Total Louisiana | 1,608,120 | 3.12 | 1,709,622 | 3.11 |
| Michigan | 45,520 | 2.85 | 43,839 | 2.81 |
| Mississippi | 161,788 | 2.76 | 151,595 | 2.67 |
| Montana | 75,323 | 2.44 | 74,621 | 2.43 |
| Nebraska | 61,824 | 2.83 | 51,605 | 2.70 |
| New Mexico: | | | | |
| Southeastern | 290,392 | 2.90 | 300,181 | 2.89 |
| Northwestern | 26,182 | 2.67 | 26,384 | 2.64 |
| Total New Mexico | 316,574 | 2.88 | 326,565 | 2.87 |
| New York | 7,707 | 4.59 | 8,321 | 4.44 |
| North Dakota | 68,332 | 2.73 | 63,813 | 2.48 |
| Ohio | 19,023 | 3.15 | 46,420 | 2.93 |
| Oklahoma | 587,709 | 2.91 | 587,320 | 2.90 |
| Pennsylvania | 23,178 | 4.56 | 22,083 | 4.32 |
| Texas:[1] | | | | |
| Gulf Coast | 610,965 | 3.25 | 613,328 | 3.20 |
| East Texas Proper | 135,598 | 3.10 | 131,717 | 3.03 |
| West Texas | 1,249,656 | 2.87 | 1,272,496 | 2.86 |
| Other districts | 912,161 | 2.95 | 911,453 | 2.94 |
| Total Texas | 2,908,380 | 2.97 | 2,928,994 | 2.96 |
| Utah | 90,943 | 2.72 | 74,867 | 2.62 |
| West Virginia | 13,367 | 3.99 | 12,975 | 3.85 |
| Wyoming | 361,018 | 2.50 | 351,043 | 2.53 |
| Other States[2] | 1,930 | 2.06 | 2,681 | 2.12 |
| Total United States | 7,965,743 | 2.89 | 8,017,078 | 2.88 |

[1] Texas Railroad Commission divisions.
[2] Arizona, Florida, Missouri, Nevada, South Dakota, Tennessee, and Virginia.

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**TABLE 25.—Posted price per barrel of petroleum at wells in the United States in 1964 by grade, with data of change**

| Date | Pennsylvania grade | | Corning grade | Western Kentucky [1] | Indiana-Illinois [1] | Cold-water, Mich. | Oklahoma-Kansas | |
|---|---|---|---|---|---|---|---|---|
| | Bradford and Allegheny districts | In southwest Pennsylvania | | | | | 34°–34.9° | 36°–36.9° |
| Jan. 1 | 4.63 | 4.08 | 2.67 | 3.00 | 3.00 | 2.80 | 2.91 | 2.97 |
| Jan. 11 | 4.48 | 3.93 | | | | | | |
| July 20 | | | | | | | | 2.92 |

| Date | Panhandle, Texas (Carson, Gray, Hutchinson, and Wheeler Counties), 35°–36.9° | West Texas 30°–30.9° (sweet) | Lea County, N. Mex., 30°–30.9° | South Texas Mirando, 24°–24.9° | East Texas | Gulf Coast | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Conroe, Tex. | Texas | | Louisiana, 30°–30.9° |
| | | | | | | | 30°–30.9° | 20°–20.9° | |
| Jan. 1 | 2.80 | 2.81 | 2.65 | 2.97 | 3.10 | 3.35 | 3.10 | 2.90 | 2.85 |

| Date | Caddo-Pine Island, La., 36°–36.9° | Magnolia-Smackover, Limestone, Ark., 31°–31.9° | Elk Basin Wyo. (incl. Montana), 30°–30.9° | California | | | |
|---|---|---|---|---|---|---|---|
| | | | | Coalinga, 32°–32.9° | Kettleman Hills, 37°–37.9° | Midway Sunset, 19°–19.9° | Wilmington, 24°–24.9° |
| Jan. 1 | 2.97 | 2.67 | 2.63 | 2.96 | 3.21 | 2.23 | 2.58 |
| June 1 | | 2.62 | | | | | |

[1] Now priced on a gravity basis.

Source: Platt's Oil Price Handbook.

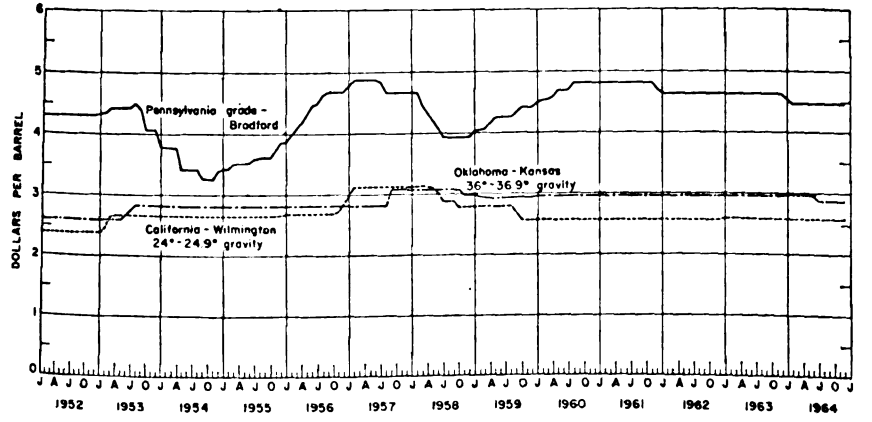


FIGURE 5.—Posted prices of selected grades of crude petroleum in the United States, 1952–64, by months.

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## REFINED PRODUCTS

### GENERAL REVIEW

Petroleum is consumed in many finished products that must be considered individually. Competition with other fuels and economic and climatic conditions influence the consumption.

Gasoline is consumed principally in highway transport, aviation, and mechanized farming. The demand for kerosine (a product defined as meeting lamp-oil specifications for color and flashpoint) continued to climb with the expanding market for commerical jet fuel, as straight kerosine is used to fuel commercial jet aircraft. Distillate fuel oil, including light diesel oils, is used for space heating and for diesel-locomotive fuel and has nearly replaced residual fuel oil and coal in railroad use. Residual fuel oil usually sells for less than crude oil at the refineries and competes directly with natural gas and coal for heavy-fuel uses. As it is not normally moved by pipeline, its distribution depends on cheap water transport and limited tank car movement. Therefore, it cannot normally compete with coal in coal-producing areas. Liquefied gases, in competition with kerosine and light distillate fuel oil in domestic use, are gaining in importance as fuel in internal-combustion engines and as the initial raw material in synthesizing many petrochemicals.

The total demand for all oils in 1964 averaged 11,061,000 barrels per day, including a domestic demand of 10,859,000 barrels and exports which averaged 202,000 barrels per day. On a percentage basis, total demand increased 2.8 percent; domestic demand increased 2.9 percent; and exports decreased 2.9 percent.

Military purchases of all petroleum products from domestic sources in 1964 averaged 464,000 barrels daily, compared with 442,000 barrels daily in 1963.

The new supply of refined products comes from crude oil fed to refineries, natural gas liquids, a small quantity of motor benzol derived from coal, and imports of refined products from foreign countries. The new supply exceeded demand in 1964 resulting in an increase of 9,048,000 barrels in stocks of refined products.

Because of separating statistics on the petrochemical feedstocks from those on the other products, some of the individual products yields for 1963 and 1964 are not comparable with previous years. The continuing decline in the residual fuel oil yield and the increase in the refinery shortage (excess of refinery output over input) reflect the trend in the petroleum industry to install more hydrocracking and coking facilities to obtain higher yields of the lighter end products.

According to the Bureau of Labor Statistics, the wholesale price index for refined products in 1964 was 92.7, compared with 97.2 in 1963. The average wholesale price for the four principal products—gasoline, kerosine, distillate fuel oil, and residual fuel oil—was 8.8 cents per gallon, compared with 9.0 cents in 1963.

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**TABLE 26.—Salient statistics of the major refined petroleum products in the United States**

(Thousand barrels)

| | 1960 | 1961 | 1962 | 1963 | 1964 p |
|---|---|---|---|---|---|
| Gasoline and naphtha: | | | | | |
| Production, total | 1,522,497 | 1,534,462 | 1,583,376 | 1,625,198 | 1,706,005 |
| From crude | 1,343,341 | 1,344,819 | 1,387,706 | 1,413,673 | 1,480,288 |
| From natural gas liquids | 178,881 | 189,474 | 195,579 | 211,445 | 225,688 |
| Benzol, etc., blended | 275 | 169 | 91 | 80 | 29 |
| Imports | 9,790 | 10,685 | 13,878 | 16,145 | 14,626 |
| Exports | 13,456 | 8,976 | 6,592 | 6,986 | 7,942 |
| Stocks, end of year | 194,774 | 184,167 | [1] 188,683 | 190,937 | 199,512 |
| Domestic demand | 1,511,670 | 1,533,173 | 1,584,691 | 1,632,103 | 1,704,114 |
| Kerosine: | | | | | |
| Production, total | 136,842 | 142,690 | 157,379 | 165,946 | 169,514 |
| From crude | 135,772 | 141,410 | 156,373 | 164,805 | 168,021 |
| From natural gas liquids | 1,070 | 1,280 | 1,006 | 1,141 | 1,493 |
| Imports | 68 | 2,964 | 6,417 | 8,642 | 11,129 |
| Exports | 689 | 231 | 337 | 672 | 171 |
| Stocks, end of year | 31,445 | 32,433 | [1] 32,398 | 34,102 | 36,165 |
| Domestic demand | 132,499 | 144,435 | 164,167 | 172,212 | [2] 178,409 |
| Distillate fuel oil: | | | | | |
| Production, total | 668,684 | 696,622 | 720,087 | 765,067 | 741,082 |
| From crude | 667,050 | 696,015 | 719,590 | 764,597 | 740,689 |
| From natural gas liquids | 1,634 | 607 | 497 | 470 | 393 |
| Crude used directly as distillate | 1,001 | 851 | 1,198 | 807 | 755 |
| Imports | 12,771 | 17,377 | 11,831 | 9,110 | 11,772 |
| Exports | 9,897 | 6,931 | 8,224 | 15,014 | 5,434 |
| Stocks, end of year | 138,455 | 152,018 | [1] 143,961 | 156,677 | 155,846 |
| Domestic demand | 685,268 | 694,356 | 732,405 | 747,254 | 749,006 |
| Residual fuel oil: | | | | | |
| Production | 332,147 | 315,577 | 295,679 | 275,910 | 268,182 |
| Crude used directly as residual | 3,948 | 3,854 | 3,797 | 3,305 | 3,720 |
| Imports | 233,208 | 243,268 | 264,314 | 272,753 | 295,891 |
| Exports | 18,495 | 14,022 | 12,850 | 15,281 | 18,870 |
| Stocks, end of year | 44,870 | 44,869 | [1] 49,775 | 47,538 | 40,403 |
| Domestic demand | 559,439 | 548,678 | 545,813 | 538,924 | 556,058 |
| Military jet fuel: | | | | | |
| Production, total | 89,109 | 95,923 | 102,974 | 99,360 | 107,993 |
| JP-4 grade | NA | NA | NA | [3] 83,189 | [3] 90,476 |
| JP-5 grade | | | | 11,441 | 12,677 |
| Other military grades | | | | 4,730 | 4,840 |
| Imports | 12,372 | 10,045 | 10,897 | 14,947 | 12,118 |
| Exports | 113 | 122 | 82 | 194 | 170 |
| Stocks, end of year | 6,456 | 8,280 | 9,668 | 8,544 | 9,904 |
| Domestic demand | 102,803 | 104,436 | 112,401 | 115,237 | 118,581 |
| Lubricants: | | | | | |
| Production | 59,389 | 59,254 | 61,467 | 63,086 | 63,668 |
| Imports | 22 | 14 | 28 | 23 | 37 |
| Exports, total | 15,811 | 17,094 | 17,693 | 18,317 | 18,160 |
| Grease | 393 | 363 | 400 | 381 | 399 |
| Oil | 15,418 | 16,731 | 17,293 | 17,936 | 17,761 |
| Stocks, end of year | 9,874 | 12,943 | 13,130 | 14,321 | 14,062 |
| Domestic demand | 42,676 | 41,534 | 43,615 | 43,601 | 45,804 |
| Wax (1 barrel=280pounds): | | | | | |
| Production | 5,896 | 5,781 | 5,353 | 5,126 | 5,352 |
| Imports | 6 | 2 | | 4 | |
| Exports | 1,333 | 1,237 | 1,429 | 1,455 | 1,734 |
| Stocks, end of year | 905 | 1,061 | 1,020 | 886 | 908 |
| Domestic demand | 4,438 | 4,390 | 3,965 | 3,809 | 3,596 |
| Coke (5 barrels=1 short ton): | | | | | |
| Production, total | 60,010 | 75,333 | 78,724 | 80,688 | 84,325 |
| Marketable coke | 26,057 | 30,480 | 31,624 | 32,428 | 34,872 |
| Catalyst coke | 33,953 | 44,853 | 47,100 | 48,260 | 49,453 |
| Exports | 6,856 | 7,270 | 7,456 | 10,762 | 13,563 |
| Stocks, end of year | 4,387 | 5,316 | 5,880 | 6,483 | 6,795 |
| Domestic demand | 54,472 | 67,134 | 70,704 | 69,323 | 70,450 |

See footnotes at end of table.

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**TABLE 26.—Salient statistics of the major refined petroleum products in the United States—Continued**

(Thousand barrels)

| | 1960 | 1961 | 1962 | 1963 | p 1964 |
|---|---|---|---|---|---|
| Asphalt (5.5 barrels=1 short ton): | | | | | |
| Production | 98,671 | 101,819 | 109,576 | 111,948 | 114,879 |
| Imports (including natural) | 6,143 | 6,609 | 6,625 | 6,211 | 5,912 |
| Exports | 924 | 667 | 826 | 703 | 767 |
| Stocks, end of year | 10,142 | 12,999 | 14,252 | 14,354 | 14,221 |
| Domestic demand | 104,696 | 107,753 | 114,122 | 117,354 | 120,147 |
| Road oil: | | | | | |
| Production | 5,970 | 5,820 | 7,079 | 6,792 | 6,371 |
| Stocks, end of year | 743 | 761 | 875 | 753 | 579 |
| Domestic demand | 5,880 | 5,802 | 6,965 | 6,914 | 6,545 |
| Still gas: | | | | | |
| Production | 129,480 | 127,537 | 130,829 | 129,598 | 131,257 |
| Liquefied gases (including ethane): | | | | | |
| Production [4] | 77,578 | 78,947 | 76,826 | 56,394 | 59,244 |
| Transfers of liquefied gas [5] from natural gasoline | 152,173 | 159,371 | 178,733 | 182,042 | 186,718 |
| Imports | 1,631 | 1,806 | 2,248 | 2,516 | 4,128 |
| Exports | 2,988 | 3,541 | 3,874 | 4,593 | 5,358 |
| Stocks, end of year | 3,623 | 6,298 | [1] 3,916 | 3,346 | 3,074 |
| Domestic demand | 227,291 | 233,908 | 255,462 | 236,929 | 245,004 |
| Petrochemical feedstocks: [6] | | | | | |
| Production | NA | NA | NA | 91,356 | 104,846 |
| Stocks, end of year | | | [1] 3,530 | 3,130 | 3,187 |
| Domestic demand, total | | | NA | 91,756 | 104,789 |
| Still gas | NA | NA | NA | 7,834 | 7,698 |
| LRG [4] | | | | 39,276 | 47,190 |
| Naphtha-400° | | | | 22,022 | 24,583 |
| Other | | | | 22,624 | 25,318 |
| Miscellaneous: | | | | | |
| Production, total | 25,852 | 28,375 | 31,661 | 16,389 | 16,874 |
| From crude | 24,358 | 26,267 | 29,794 | 13,578 | 13,583 |
| From natural gas liquids | 1,494 | 2,108 | 1,867 | 2,811 | 3,291 |
| Imports | 47 | | | | |
| Exports | 257 | 245 | 237 | 239 | 236 |
| Stocks, end of year | 2,715 | 2,832 | [2] 1,831 | 1,631 | 1,819 |
| Domestic demand | 25,208 | 28,144 | 30,890 | 16,350 | 16,450 |
| Other unfinished oils: | | | | | |
| Rerun (net) | 22,094 | 21,202 | 27,733 | 31,934 | 27,322 |
| Imports | 16,478 | 25,348 | 32,516 | 31,702 | 32,587 |
| Stocks, end of year | 61,615 | 79,366 | 81,981 | 81,749 | 87,014 |
| Shortage or (overage) | (53,282) | (65,429) | (63,901) | (73,710) | (79,335) |

p Preliminary. NA Not available.

[1] New basis. These data are comparable to 1963 because of product reclassification resulting from separately reporting data for petrochemical feedstocks.

[2] Sales of commercial jet fuel: PAD districts 1–4, 61,077,000 barrels; district 5, 24,595,000 barrels.

[3] Includes military jet fuel produced at natural gas liquid plants: 1963; 615,000 barrels, 1964; 409,000 barrels.

[4] Liquefied refinery gases (LRG).

[5] Liquefied petroleum gases (LPG).

[6] Produced at petroleum refineries.

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**TABLE 27.—Input and output of petroleum products at refineries in the United States**

(Thousand barrels)

| | 1960 | 1961 | 1962 | 1963 | ▸ 1964 |
|---|---|---|---|---|---|
| **Input:** | | | | | |
| Crude petroleum: | | | | | |
| Domestic | 2,581,568 | 2,604,127 | 2,659,826 | 2,758,168 | 2,804,198 |
| Foreign | 370,966 | 383,031 | 409,805 | 412,484 | 437,434 |
| Total crude petroleum | 2,952,534 | 2,987,158 | 3,069,631 | 3,170,652 | 3,241,632 |
| Natural gas liquids | 166,518 | 169,278 | 182,756 | 190,143 | 194,961 |
| Benzol | 275 | 169 | 91 | 80 | 29 |
| Total input | 3,119,327 | 3,156,605 | 3,252,478 | 3,360,875 | 3,436,622 |
| **Output:** | | | | | |
| Gasoline [1] | 1,510,134 | 1,514,266 | 1,570,553 | 1,603,896 | 1,675,278 |
| Kerosine [2] | 135,772 | 141,410 | 156,373 | 164,805 | 168,021 |
| Distillate fuel oil [2] | 667,050 | 696,015 | 719,590 | 764,597 | 740,689 |
| Residual fuel oil | 332,147 | 315,577 | 295,679 | 275,910 | 268,182 |
| Military jet fuel [2] | 88,248 | 95,210 | 102,269 | 98,745 | 107,584 |
| Lubricants | 59,389 | 59,254 | 61,467 | 63,086 | 63,668 |
| Wax [3] | 5,896 | 5,781 | 5,353 | 5,126 | 5,352 |
| Coke [3] | 60,010 | 75,333 | 78,724 | 80,688 | 84,325 |
| Asphalt [3] | 98,671 | 101,819 | 109,576 | 111,948 | 114,879 |
| Road oil | 5,970 | 5,820 | 7,079 | 6,792 | 6,371 |
| Still gas | 129,480 | 127,537 | 130,829 | 129,598 | 131,257 |
| Liquefied gases | 77,578 | 78,947 | 76,826 | 56,394 | 59,244 |
| Petrochemical feedstocks | [4] NA | [4] NA | [4] NA | 91,356 | 104,846 |
| Other finished products [2] | 24,358 | 26,267 | 29,794 | 13,578 | 13,583 |
| Other unfinished oils (net) [5] | −22,094 | [1] −21,202 | [1] −27,733 | [1] −31,934 | [1] −27,322 |
| Shortage (or overage) [6] | −53,282 | −65,429 | −63,901 | −73,710 | −79,335 |
| Total output | 3,119,327 | 3,156,605 | 3,252,478 | 3,360,875 | 3,436,622 |

▸ Preliminary. NA Not Available.

[1] For 1960 figures for unfinished gasoline are included in those for gasoline. For 1961–64 figures for unfinished gasoline are included in those for unfinished oils.

[2] Production at natural gasoline plants shown as direct "transfers" and omitted from the input and output at refineries.

[3] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton.

[4] Formerly included with gasoline, kerosine, distillate fuel oil, residual fuel oil, liquefied petroleum gases, miscellaneous oils and unfinished oils.

[5] Negative quantity; represents net excess of unfinished oil reruns over unfinished oil produced.

[6] Includes losses or gains in volume during processing.

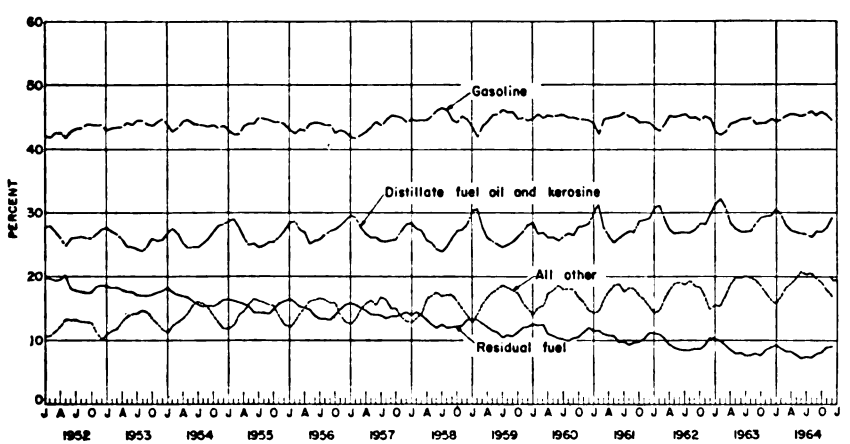


**FIGURE 6.—Yields of principal products from crude runs to stills in the United States, 1952–64, by months.**

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**TABLE 28.—Percentage yields of refined petroleum products from crude oil in the United States [1]**

| Product | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | p 1964 |
|---|---|---|---|---|---|---|---|---|---|---|
| Finished products: | | | | | | | | | | |
| Gasoline | 44.0 | 43.4 | 43.8 | 43.2 | 44.9 | 45.2 | 44.7 | 44.8 | 44.1 | 45.2 |
| Kerosine | 4.3 | 4.2 | 3.8 | 3.9 | 3.8 | 4.6 | 4.7 | 5.0 | 5.1 | 5.2 |
| Distillate fuel oil | 22.0 | 22.9 | 23.1 | 22.4 | 23.1 | 22.4 | 23.1 | 23.2 | 23.9 | 22.6 |
| Residual fuel oil | 15.3 | 14.7 | 14.4 | 12.9 | 11.8 | 11.2 | 10.5 | 9.6 | 8.6 | 8.2 |
| Military jet fuel | 2.1 | 2.3 | 2.2 | 2.6 | 3.2 | 3.0 | 3.1 | 3.3 | 3.1 | 3.3 |
| Lubricating oil | 2.0 | 2.0 | 1.9 | 1.8 | 1.9 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Wax | .2 | .2 | .2 | .2 | .2 | .2 | .2 | .1 | .1 | .1 |
| Coke | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 2.0 | 2.5 | 2.6 | 2.6 | 2.6 |
| Asphalt | 3.0 | 3.1 | 3.0 | 3.2 | 3.3 | 3.3 | 3.4 | 3.5 | 3.5 | 3.5 |
| Road oil | .3 | .3 | .2 | .2 | .2 | .2 | .2 | .2 | .2 | .2 |
| Still gas | 4.3 | 4.2 | 4.3 | 4.4 | 4.3 | 4.4 | 4.2 | 4.3 | 4.0 | 4.0 |
| Liquefied gases | 1.6 | 1.8 | 1.9 | 2.0 | 2.3 | 2.6 | 2.7 | 2.5 | 1.8 | 1.9 |
| Petrochemical feedstocks | (2) | (2) | (2) | (2) | (2) | (2) | (2) | (2) | 2.8 | 3.2 |
| Other finished products | .4 | .4 | .5 | .7 | .7 | .8 | .8 | .9 | .4 | .4 |
| Shortage | −.5 | −.6 | −.5 | −.8 | −1.1 | −1.9 | −2.1 | −2.0 | −2.2 | −2.4 |
| | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

p Preliminary.
[1] Other unfinished oils added to crude in computing yields.
[2] Included with gasoline, kerosine, distillate fuel oil, residual fuel oil, liquefied petroleum gases, and miscellaneous and unfinished oils.

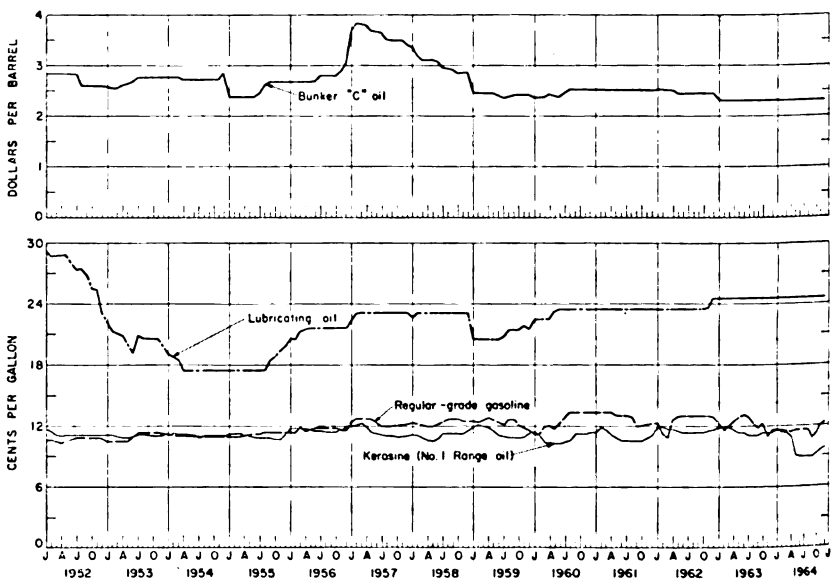
DOLLARS PER BARREL
Bunker "C" oil
CENTS PER GALLON
Lubricating oil
Regular-grade gasoline
Kerosine (No. 1 Range oil)
J A J O J A J O J A J O J A J O J A J O J A J O J A J O J A J O J A J O J A J O J A J O J A J O J
1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964

FIGURE 7.—Prices of Bunker "C" oil at New York Harbor, bright stock at Oklahoma refineries, No. 1 range oil at Chicago district, and regular-grade gasoline at refineries in Oklahoma, 1952–64, by months.

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## TABLE 29.—Stocks of refined petroleum products in the United States at end of month

(Thousand barrels)

| Product | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | |
| Gasoline | 201,005 | 209,396 | 214,717 | 204,787 | 195,706 | 192,629 | 184,712 | 177,714 | 181,283 | 178,265 | 181,257 | 190,937 |
| Kerosine | 26,103 | 23,789 | 23,216 | 27,344 | 29,578 | 32,285 | 35,246 | 36,214 | 35,978 | 39,118 | 39,131 | 34,102 |
| Distillate fuel oil | 111,674 | 87,812 | 83,913 | 91,718 | 103,160 | 123,364 | 145,239 | 164,917 | 177,231 | 191,394 | 192,561 | 156,677 |
| Residual fuel oil | 46,896 | 43,627 | 42,867 | 44,685 | 46,648 | 48,100 | 50,885 | 52,456 | 52,624 | 54,359 | 52,250 | 47,538 |
| Military jet fuel | 9,774 | 8,979 | 9,792 | 9,287 | 9,628 | 10,180 | 10,245 | 9,619 | 9,310 | 8,589 | 8,912 | 8,544 |
| Lubricating oil | 13,343 | 13,783 | 14,147 | 13,678 | 13,240 | 13,380 | 13,447 | 13,450 | 13,815 | 13,435 | 14,035 | 14,321 |
| Wax | 1,032 | 1,004 | 918 | 881 | 859 | 911 | 885 | 908 | 903 | 877 | 860 | 886 |
| Coke | 5,954 | 6,020 | 6,003 | 5,905 | 5,692 | 5,643 | 5,786 | 5,762 | 5,857 | 5,973 | 6,906 | 6,483 |
| Asphalt | 16,316 | 18,228 | 20,729 | 23,850 | 20,948 | 19,850 | 16,814 | 14,495 | 12,779 | 10,366 | 11,874 | 14,354 |
| Road oil | 969 | 1,028 | 1,318 | 1,630 | 1,698 | 1,687 | 1,424 | 1,170 | 942 | 851 | 780 | 753 |
| Liquefied refinery gases | 2,824 | 2,172 | 2,642 | 2,967 | 3,707 | 4,089 | 4,477 | 4,677 | 4,922 | 4,860 | 4,568 | 3,346 |
| Petrochemical feedstocks | 3,016 | 2,852 | 2,900 | 3,432 | 3,611 | 3,785 | 3,793 | 3,719 | 3,595 | 3,457 | 3,134 | 3,130 |
| Miscellaneous | 2,086 | 1,744 | 1,693 | 1,675 | 1,529 | 1,597 | 1,689 | 1,682 | 1,575 | 1,404 | 1,427 | 1,631 |
| Other unfinished oils | 78,772 | 79,216 | 81,190 | 85,137 | 90,355 | 90,443 | 89,294 | 86,793 | 83,744 | 85,361 | 86,287 | 81,749 |
| Total 1963 | 519,764 | 499,650 | 506,045 | 516,976 | 526,359 | 547,943 | 563,936 | 573,576 | 584,558 | 598,309 | 603,982 | 564,451 |
| 1964: p | | | | | | | | | | | | |
| Gasoline | 203,237 | 215,091 | 220,357 | 214,671 | 210,924 | 198,500 | 191,363 | 190,868 | 188,573 | 187,165 | 197,245 | 199,512 |
| Kerosine | 30,863 | 28,528 | 28,454 | 29,063 | 30,535 | 32,845 | 34,428 | 36,042 | 37,280 | 37,874 | 38,620 | 36,165 |
| Distillate fuel oil | 128,534 | 110,527 | 99,195 | 97,758 | 112,185 | 130,272 | 153,642 | 175,033 | 186,726 | 189,364 | 182,579 | 155,846 |
| Residual fuel oil | 45,352 | 43,262 | 39,100 | 38,477 | 40,459 | 40,356 | 42,977 | 44,644 | 45,364 | 45,936 | 46,135 | 40,403 |
| Military jet fuel | 8,510 | 8,982 | 9,882 | 9,158 | 9,331 | 8,580 | 9,497 | 10,701 | 9,577 | 9,073 | 8,907 | 9,904 |
| Lubricating oil | 14,291 | 14,330 | 14,399 | 13,318 | 13,838 | 13,142 | 12,885 | 12,889 | 13,006 | 13,043 | 13,323 | 14,062 |
| Wax | 854 | 871 | 858 | 859 | 889 | 911 | 900 | 881 | 837 | 835 | 866 | 908 |
| Coke | 6,421 | 6,564 | 6,646 | 6,794 | 6,893 | 6,963 | 7,086 | 6,894 | 6,696 | 6,619 | 6,878 | 6,795 |
| Asphalt | 15,815 | 18,137 | 21,261 | 22,318 | 21,998 | 20,172 | 17,825 | 15,351 | 12,781 | 11,066 | 11,705 | 14,231 |
| Road oil | 849 | 972 | 1,432 | 1,696 | 1,591 | 1,506 | 1,210 | 1,094 | 856 | 529 | 538 | 579 |
| Liquefied refinery gases | 2,732 | 2,445 | 2,693 | 2,790 | 3,413 | 3,865 | 4,076 | 4,204 | 4,046 | 4,349 | 4,054 | 3,074 |
| Petrochemical feedstocks | 3,343 | 3,454 | 3,460 | 3,530 | 3,146 | 2,793 | 2,948 | 3,211 | 3,321 | 3,056 | 3,298 | 3,187 |
| Miscellaneous | 1,570 | 1,535 | 1,597 | 1,559 | 1,650 | 1,591 | 1,611 | 1,675 | 1,671 | 1,591 | 1,658 | 1,819 |
| Other unfinished oils | 80,976 | 80,738 | 83,151 | 88,015 | 89,623 | 88,606 | 84,896 | 85,252 | 86,161 | 86,374 | 86,620 | 87,014 |
| Total 1964 | 543,347 | 535,436 | 532,485 | 530,006 | 546,475 | 550,102 | 565,344 | 588,739 | 596,895 | 596,874 | 602,426 | 573,499 |

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**TABLE 30.—Input and output at refineries in the United States, by months**

(Thousand barrels)

| | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| Input: | | | | | | | | | | | | | |
| Crude petroleum: | | | | | | | | | | | | | |
| Domestic | 232, 556 | 217, 809 | 234, 284 | 218, 924 | 229, 689 | 228, 972 | 235, 973 | 238, 086 | 226, 561 | 233, 903 | 227, 991 | 233, 420 | 2, 758, 168 |
| Foreign | 36, 882 | 33, 613 | 34, 708 | 30, 792 | 34, 247 | 34, 617 | 36, 691 | 35, 446 | 33, 645 | 32, 981 | 33, 010 | 35, 852 | 412, 484 |
| Natural gas liquids | 16, 607 | 14, 343 | 15, 300 | 15, 263 | 15, 350 | 14, 738 | 14, 786 | 15, 884 | 16, 235 | 17, 432 | 16, 673 | 17, 532 | 190, 143 |
| Benzol | 7 | 6 | 7 | 10 | 7 | 6 | 7 | 7 | 6 | 7 | 5 | 5 | 80 |
| Total input | 286, 052 | 265, 771 | 284, 299 | 264, 989 | 279, 293 | 278, 333 | 287, 457 | 289, 423 | 276, 447 | 284, 323 | 277, 679 | 286, 809 | 3, 360, 875 |
| Output: | | | | | | | | | | | | | |
| Gasoline [1] | 134, 872 | 121, 760 | 131, 053 | 124, 957 | 131, 597 | 134, 356 | 139, 450 | 141, 670 | 133, 362 | 136, 130 | 133, 204 | 141, 485 | 1, 603, 896 |
| Kerosine [2] | 15, 667 | 14, 943 | 14, 428 | 13, 461 | 11, 840 | 11, 610 | 12, 834 | 12, 445 | 12, 163 | 14, 709 | 14, 659 | 16, 046 | 164, 805 |
| Distillate fuel oil [2] | 70, 904 | 66, 598 | 68, 407 | 57, 234 | 60, 155 | 60, 073 | 62, 319 | 63, 309 | 63, 117 | 63, 824 | 62, 858 | 65, 799 | 764, 597 |
| Residual fuel oil | 27, 313 | 25, 334 | 25, 406 | 21, 481 | 21, 000 | 21, 811 | 21, 748 | 21, 795 | 21, 521 | 21, 031 | 22, 501 | 24, 969 | 275, 910 |
| Military jet fuel [2] | 7, 631 | 7, 032 | 8, 312 | 8, 141 | 8, 527 | 8, 874 | 9, 055 | 8, 836 | 8, 450 | 7, 822 | 8, 322 | 7, 743 | 98, 745 |
| Lubricating oil | 5, 110 | 4, 844 | 5, 122 | 5, 206 | 5, 478 | 5, 252 | 5, 570 | 5, 422 | 5, 367 | 5, 433 | 5, 314 | 4, 968 | 63, 086 |
| Wax [3] | 379 | 386 | 420 | 437 | 440 | 473 | 404 | 461 | 447 | 443 | 384 | 452 | 5, 126 |
| Coke [3] | 6, 634 | 6, 182 | 6, 683 | 6, 478 | 6, 505 | 6, 598 | 7, 037 | 6, 925 | 6, 748 | 6, 835 | 6, 776 | 7, 287 | 80, 688 |
| Asphalt | 4, 954 | 4, 588 | 6, 520 | 8, 603 | 11, 056 | 12, 100 | 12, 878 | 13, 182 | 12, 360 | 11, 286 | 8, 182 | 6, 239 | 111, 948 |
| Road oil | 214 | 185 | 448 | 678 | 663 | 1, 061 | 1, 271 | 1, 008 | 584 | 438 | 132 | 110 | 6, 792 |
| Still gas | 10, 296 | 9, 591 | 10, 527 | 10, 368 | 11, 020 | 11, 376 | 12, 015 | 11, 690 | 10, 821 | 10, 561 | 10, 512 | 10, 821 | 129, 598 |
| Liquefied refinery gases | 4, 628 | 4, 359 | 4, 903 | 4, 758 | 5, 043 | 4, 931 | 5, 041 | 4, 878 | 4, 447 | 4, 176 | 4, 202 | 5, 028 | 56, 394 |
| Petrochemical feedstocks | 6, 064 | 5, 979 | 7, 771 | 7, 313 | 7, 897 | 8, 045 | 7, 899 | 8, 100 | 7, 603 | 8, 241 | 7, 638 | 8, 806 | 91, 356 |
| Miscellaneous | 1, 182 | 976 | 1, 149 | 979 | 1, 085 | 1, 177 | 1, 244 | 1, 212 | 1, 180 | 1, 163 | 1, 110 | 1, 121 | 13, 578 |
| Other unfinished oils (net) [4] | −5, 409 | −1, 714 | −405 | 1, 033 | 2, 729 | −2, 798 | −4, 720 | −5, 186 | −5, 671 | −1, 389 | −1, 742 | −6, 662 | −31, 934 |
| Shortage or overage | −4, 387 | −5, 272 | −6, 445 | −6, 138 | −5, 742 | −6, 606 | −6, 588 | −6, 324 | −6, 052 | −6, 380 | −6, 373 | −7, 403 | −73, 710 |
| Total output | 286, 052 | 265, 771 | 284, 299 | 264, 989 | 279, 293 | 278, 333 | 287, 457 | 289, 423 | 276, 447 | 284, 323 | 277, 679 | 286, 809 | 3, 360, 875 |

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| 1964: [p] | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Input:** | | | | | | | | | | | | | |
| Crude petroleum: | | | | | | | | | | | | | |
| Domestic | 237,753 | 223,712 | 235,897 | 224,842 | 232,910 | 229,206 | 241,291 | 240,936 | 231,157 | 234,646 | 227,939 | 243,909 | 2,804,198 |
| Foreign | 35,586 | 33,120 | 33,906 | 33,527 | 34,675 | 38,832 | 40,427 | 40,071 | 37,969 | 38,689 | 34,661 | 35,881 | 437,434 |
| Natural gas liquids | 16,103 | 14,956 | 15,259 | 14,912 | 15,371 | 14,864 | 15,724 | 16,295 | 17,072 | 17,599 | 18,047 | 18,759 | 194,961 |
| Benzol | 9 | 3 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 1 | 1 | 3 | 29 |
| Total | 289,451 | 271,791 | 285,153 | 273,282 | 282,958 | 282,903 | 297,444 | 297,305 | 286,200 | 290,935 | 280,648 | 298,552 | 3,436,622 |
| **Output:** | | | | | | | | | | | | | |
| Gasoline [1] | 139,475 | 130,437 | 137,400 | 131,861 | 137,925 | 137,934 | 146,630 | 146,724 | 139,566 | 143,930 | 138,518 | 144,878 | 1,675,278 |
| Kerosine [2] | 17,080 | 14,567 | 14,211 | 12,396 | 11,500 | 11,419 | 12,548 | 13,288 | 13,825 | 15,211 | 14,939 | 17,037 | 168,021 |
| Distillate fuel oil [2] | 67,443 | 62,812 | 61,681 | 57,525 | 60,775 | 61,092 | 64,184 | 61,986 | 59,347 | 59,010 | 58,662 | 66,172 | 740,689 |
| Residual fuel oil | 25,826 | 22,747 | 22,298 | 21,231 | 20,821 | 19,519 | 21,556 | 21,114 | 21,280 | 22,543 | 23,545 | 25,702 | 268,182 |
| Military jet fuel [2] | 7,766 | 7,896 | 9,070 | 8,812 | 9,467 | 9,829 | 9,971 | 10,364 | 8,850 | 8,699 | 8,662 | 8,198 | 107,584 |
| Lubricating oil | 5,150 | 4,828 | 5,207 | 5,285 | 5,397 | 5,250 | 5,357 | 5,415 | 5,284 | 5,431 | 5,347 | 5,717 | 63,668 |
| Wax [3] | 404 | 409 | 456 | 443 | 491 | 446 | 438 | 433 | 435 | 473 | 475 | 449 | 5,352 |
| Coke | 7,200 | 6,715 | 7,287 | 6,831 | 7,045 | 7,180 | 7,505 | 7,075 | 6,747 | 6,910 | 6,770 | 7,060 | 84,325 |
| Asphalt | 4,435 | 5,556 | 7,286 | 7,995 | 11,168 | 12,743 | 13,582 | 13,658 | 12,474 | 11,712 | 8,191 | 6,079 | 114,879 |
| Road oil | 155 | 188 | 543 | 447 | 512 | 948 | 1,282 | 959 | 513 | 328 | 332 | 164 | 6,371 |
| Still gas | 10,617 | 9,942 | 10,820 | 10,618 | 11,212 | 11,654 | 12,208 | 11,479 | 10,935 | 10,539 | 10,438 | 10,795 | 131,257 |
| Liquefied refinery gases | 5,030 | 4,680 | 5,208 | 4,788 | 5,179 | 5,061 | 5,136 | 4,932 | 4,643 | 4,869 | 4,625 | 5,093 | 59,244 |
| Petrochemical feedstocks | 8,963 | 8,215 | 9,051 | 8,881 | 8,381 | 8,693 | 9,154 | 8,705 | 8,707 | 8,771 | 8,490 | 8,845 | 104,846 |
| Miscellaneous | 1,182 | 1,024 | 1,057 | 1,075 | 1,065 | 1,284 | 1,186 | 1,076 | 1,081 | 1,110 | 1,175 | 1,268 | 13,583 |
| Other unfinished oils (net) [4] | −3,992 | −1,937 | −117 | 1,860 | −1,783 | −3,759 | −6,144 | −2,987 | −950 | −2,236 | −2,381 | −2,896 | −27,322 |
| Shortage or overage | −7,283 | −6,288 | −6,305 | −6,766 | −6,197 | −6,380 | −7,149 | −6,916 | −6,537 | −6,365 | −7,140 | −6,009 | −79,335 |
| Total output | 289,451 | 271,791 | 285,153 | 273,282 | 282,958 | 282,903 | 297,444 | 297,305 | 286,200 | 290,935 | 280,648 | 298,552 | 3,436,622 |

[p] Preliminary.
[1] Includes natural gas liquids: naphtha and benzol blended at refineries.
[2] Production at natural gas processing plants shown as direct transfers and omitted from the input and output at refineries.
[3] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton.
[4] Negative quantity; represents net excess of unfinished oils rerun over unfinished oils produced.

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## TABLE 31.—Input and output at refineries in the United States, by districts

(Thousand barrels)

| | East Coast | Appalachian No. 1 | Appalachian No. 2 | Indiana, Illinois, Kentucky, etc. | Minnesota, Wisconsin, etc. | Oklahoma, Kansas, etc. | Texas Inland | Texas Gulf Coast | Louisiana Gulf Coast | Arkansas, Louisiana Inland etc. | New Mexico | Rocky Mountain | West Coast | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | | |
| Input: | | | | | | | | | | | | | | |
| Crude pertoleum: | | | | | | | | | | | | | | |
| Domestic | 174,863 | 31,590 | 36,269 | 555,992 | 27,784 | 272,233 | 112,934 | 763,318 | 282,491 | 43,980 | 9,944 | 108,744 | 338,026 | 2,758,168 |
| Foreign | 242,138 | 6,028 | | 13,873 | 21,167 | | | 277 | 607 | | | 3,429 | 124,965 | 412,484 |
| Natural gas liquids | 3,890 | 54 | 881 | 16,107 | 1,492 | 19,213 | 24,771 | 70,659 | 16,026 | 7,557 | 1,468 | 4,127 | 23,898 | 190,143 |
| Benzol | 24 | | | 18 | | | | | | | | 38 | | 80 |
| Total input | 420,915 | 37,672 | 37,150 | 585,990 | 50,443 | 291,446 | 137,705 | 834,254 | 299,124 | 51,537 | 11,412 | 116,338 | 486,889 | 3,360,875 |
| Output: | | | | | | | | | | | | | | |
| Gasoline [1] | 202,888 | 15,669 | 18,920 | 292,632 | 24,447 | 154,622 | 78,671 | 377,480 | 136,965 | 24,626 | 5,837 | 54,444 | 216,695 | 1,603,896 |
| Kerosine [2] | 15,093 | 1,337 | 1,976 | 33,012 | 1,997 | 5,269 | 4,509 | 53,362 | 25,942 | 1,729 | 167 | 2,304 | 18,108 | 164,805 |
| Distillate fuel oil [2] | 129,378 | 9,108 | 7,310 | 123,297 | 11,220 | 68,465 | 19,448 | 208,686 | 74,098 | 9,966 | 1,597 | 24,545 | 77,479 | 764,597 |
| Residual fuel oil | 40,309 | 3,882 | 3,431 | 51,295 | 6,209 | 6,124 | 4,642 | 35,744 | 14,378 | 2,205 | 671 | 13,614 | 93,406 | 275 910 |
| Military jet fuel [2] | 2,573 | 318 | 189 | 11,290 | 1,940 | 13,261 | 12,160 | 16,475 | 12,428 | 1,077 | 1,564 | 5,789 | 19,681 | 98,745 |
| Lubricating oil | 7,960 | 3,315 | 413 | 5,316 | | 5,050 | 158 | 25,334 | 7,712 | 1,916 | | 364 | 5,548 | 63,086 |
| Wax [3] | 1,662 | 383 | 81 | 344 | | 516 | 85 | 1,032 | 471 | | | 82 | 470 | 5,126 |
| Coke [3] | 13,468 | 148 | 568 | 16,438 | 2,001 | 7,760 | 2,015 | 17,057 | 6,382 | 2,087 | 47 | 2,548 | 10,169 | 80,688 |
| Asphalt [3] | 26,115 | 1,668 | 3,185 | 21,346 | 1,582 | 10,961 | 5,475 | 7,786 | 5,371 | 5,577 | 602 | 6,535 | 15,745 | 111,948 |
| Road oil | 26 | | 9 | 1,838 | 108 | 1,717 | | 15 | 1 | | | 1,905 | 1,173 | 6,792 |
| Still gas | 17,128 | 1,838 | 1,833 | 24,911 | 1,303 | 11,255 | 5,821 | 26,120 | 8,159 | 2,001 | 283 | 3,658 | 25,288 | 129,598 |
| Liquefied refinery gas | 9,890 | 681 | 430 | 10,268 | 1,059 | 7,520 | 2,710 | 7,842 | 5,547 | 960 | 301 | 1,633 | 7,553 | 56,394 |
| Petrochemical feedstocks | 5,773 | 311 | | 6,989 | | 733 | 1,562 | 52,379 | 15,054 | 877 | 104 | 280 | 7,294 | 91,356 |
| Miscellaneous | 1,863 | 231 | 50 | 1,234 | 73 | 1,716 | 2,136 | 3,335 | 121 | 24 | | 280 | 2,515 | 13,578 |
| Other unfinished oils (net) | −40,458 | −899 | −652 | 769 | −142 | 1,446 | −1,114 | 21,531 | −4,584 | −845 | −21 | −407 | −6,558 | −31,934 |
| Shortage or overage [4] | −12,753 | −318 | −593 | −14,989 | −1,354 | −4,969 | −573 | −19,924 | −8,921 | −663 | 260 | −1,236 | −7,677 | −73,710 |
| Total output | 420,915 | 37,672 | 37,150 | 585,990 | 50,443 | 291,446 | 137,705 | 834,254 | 299,124 | 51,537 | 11,412 | 116,338 | 486,889 | 3,360,875 |

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| 1964: [p] | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Input: | | | | | | | | | | | | | | |
| Crude petroleum: | | | | | | | | | | | | | | |
| Domestic | 160,612 | 30,821 | 37,235 | 504,795 | 27,297 | 272,249 | 115,721 | 782,283 | 311,780 | 44,985 | 10,811 | 112,202 | 333,407 | 2,804,201 |
| Foreign | 244,332 | 7,893 | ------- | 12,913 | 26,399 | ------- | ------- | 19 | 557 | 61 | ------- | 4,647 | 140,613 | 437,431 |
| Natural gas liquids | 5,129 | 12 | 851 | 17,904 | 1,953 | 19,214 | 24,023 | 70,082 | 17,780 | 7,745 | 1,312 | 4,298 | 24,658 | 194,961 |
| Benzol | 3 | ------- | ------- | 7 | ------- | ------- | ------- | ------- | ------- | ------- | ------- | 19 | ------- | 29 |
| Total input | 410,076 | 38,726 | 38,086 | 595,619 | 55,649 | 291,463 | 139,744 | 852,384 | 330,117 | 52,791 | 12,123[1] | 121,166 | 498,678 | 3,436,622 |
| Output: | | | | | | | | | | | | | | |
| Gasoline [1] | 207,241 | 16,604 | 19,671 | 309,491 | 27,455 | 160,324 | 77,812 | 388,003 | 156,788 | 24,983 | 6,770 | 56,840 | 223,296 | 1,675,278 |
| Kerosine [2] | 14,046 | 1,404 | 1,924 | 31,409 | 1,823 | 6,070 | 4,758 | 53,528 | 27,576 | 2,003 | 152 | 2,890 | 20,438 | 168,021 |
| Distillate fuel oil [2] | 119,640 | 9,429 | 7,001 | 115,956 | 12,873 | 65,070 | 19,319 | 200,801 | 74,555 | 10,386 | 1,712 | 25,833 | 78,114 | 740,689 |
| Residual fuel oil | 37,291 | 3,864 | 3,569 | 48,567 | 6,257 | 4,532 | 4,342 | 32,249 | 17,540 | 2,280 | 423 | 12,947 | 94,321 | 268,182 |
| Military jet fuel [2] | 2,200 | 270 | 397 | 11,233 | 1,941 | 12,067 | 13,605 | 19,362 | 15,171 | 1,330 | 1,373 | 5,944 | 22,631 | 107,584 |
| Lubricating oil | 8,075 | 3,210 | 399 | 5,609 | ------- | 4,925 | 156 | 25,932 | 7,436 | 2,012 | ------- | 337 | 5,677 | 63,668 |
| Wax [3] | 1,931 | 445 | 91 | 358 | ------- | 537 | 95 | 995 | 380 | ------- | ------- | 92 | 428 | 5,352 |
| Coke | 14,318 | 226 | 549 | 17,448 | 2,550 | 7,649 | 2,128 | 17,106 | 7,199 | 2,110 | 51 | 2,634 | 10,357 | 84,325 |
| Asphalt | 26,554 | 1,643 | 3,144 | 21,945 | 1,792 | 11,724 | 5,525 | 7,731 | 4,722 | 5,592 | 775 | 7,417 | 16,315 | 114,879 |
| Road oil | 20 | ------- | 10 | 1,882 | 150 | 1,773 | ------- | 1 | ------- | ------- | 2 | 1,445 | 1,088 | 6,371 |
| Still gas | 17,132 | 1,839 | 1,816 | 26,063 | 1,437 | 11,116 | 5,542 | 27,526 | 9,000 | 1,776 | 317 | 3,785 | 23,908 | 131,257 |
| Liquefied refinery gas | 9,826 | 726 | 453 | 11,640 | 1,154 | 7,620 | 2,969 | 8,505 | 5,459 | 1,580 | 282 | 1,737 | 7,293 | 59,244 |
| Petrochemical feedstocks | 6,958 | 330 | ------- | 7,969 | ------- | 730 | 3,571 | 57,290 | 18,140 | 961 | 131 | 274 | 8,492 | 104,846 |
| Miscellaneous | 1,428 | 243 | 71 | 1,328 | 95 | 2,043 | 1,803 | 3,496 | 156 | 17 | ------- | 137 | 2,766 | 13,583 |
| Other unfinished oils (net) [4] | −45,419 | −1,139 | −477 | 1,952 | −159 | −361 | −1,265 | 30,415 | −3,159 | −978 | −34 | 335 | −7,033 | −27,322 |
| Shortage or overage | −11,165 | −368 | −532 | −17,231 | −1,719 | −4,256 | −676 | −20,566 | −10,846 | −1,261 | 169 | −1,481 | −9,413 | −79,335 |
| Total output | 410,076 | 38,726 | 38,086 | 595,619 | 55,649 | 291,563 | 139,744 | 852,384 | 330,117 | 52,791 | 12,123 | 121,166 | 498,678 | 3,436,622 |

[p] Preliminary.
[1] Includes natural gas liquids and benzol blended at refineries.
[2] Production at natural gas processing plants shown as direct transfers and omitted from the input and output at refineries.
[3] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton.
[4] Negative quantity: represents net excess of unfinished oils rerun over unfinished oil produced.

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## REFINERY CAPACITY

On January 1, 1965, there were 300 petroleum refineries in the United States with a total installed crude-oil throughput capacity of 10,774,595 barrels per calendar day. Compared with last year, this represents a decrease of 4 in the number of refineries and an increase of 389,221 barrels per day in total capacity. At the beginning of 1965, 2.5 percent of the total operable capacity was shut down compared with 2.4 percent a year ago.

The operating ratio of the petroleum refining industry at the beginning of 1965, which is the ratio of January 1965 crude runs to the total operable capacity was 85.8 percent. This compares with 85.6 percent at the beginning of 1964.

TABLE 32.—Petroleum refinery capacity in the United States as of Jan. 1, 1960–65

| | Number of refineries | | | | Crude-oil throughput capacity (barrels per day) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Shutdown | | | |
| | Operating | Shutdown | Total | Building | Operating | Operable | Inoperable | Total | Building |
| 1960 | 290 | 20 | 310 | 2 | 9,543,329 | 299,295 | 58,800 | 9,901,424 | 70,947 |
| 1961 | 289 | 22 | 311 | ---------- | 9,629,685 | 368,888 | 11,500 | 10,010,073 | 36,500 |
| 1962 | 287 | 24 | 311 | 1 | 9,812,248 | 220,799 | 72,100 | 10,105,147 | 110,350 |
| 1963 | 287 | 21 | 308 | 2 | 9,814,791 | 196,130 | 107,400 | 10,118,321 | 178,300 |
| 1964 | 282 | 22 | 304 | 1 | 10,063,164 | 242,610 | 79,600 | 10,385,374 | 54,700 |
| 1965 | 273 | 27 | 300 | 1 | 10,161,311 | 258,540 | 354,744 | 10,774,595 | 74,960 |

## AVIATION GASOLINE

Because of a decline in deliveries to the military, the total demand for aviation gasoline in 1964 was 2.8 percent less than in 1963. Alkylate production increased over 7.6 million barrels and was used mainly in the production of automotive gasoline.

Jet-type fuels are not included in aviation gasoline. The fuel used in commercial jetplanes (mostly straight kerosine) is reported in the section on kerosine and that used by the military is reported in the section on jet fuel.

## GASOLINE

The total demand for gasoline was 4,678,000 barrels per day in 1964 and included a domestic demand of 4,656,000 barrels per day and exports of 22,000 barrels per day.

Civilian highway use of gasoline, as calculated from data compiled

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by the Bureau of Public Roads, totaled 1,530.2 million barrels in 1964, compared with 1,458.9 million barrels in 1963. Nonhighway motor vehicles, military vehicles, stationary and marine engines, and losses, consumed the remainder of the gasoline (126.1 million barrels).

The production of gasoline and naphtha from crude oil in 1964 was 1,480,288,000 barrels. Natural-gas liquids plants produced 225,688,000 barrels, and in addition, 29,000 barrels of benzol were blended into the gasoline at the refineries.

Table 36 shows consumption and distribution of gasoline by PAD districts, and the interdistrict shipments which balance the supply and demand for each district. The consumption data compiled by the American Petroleum Institute exclude naphtha and offshore military shipments. For comparative purposes in the table, the naphtha has been excluded from gasoline production and stocks. No breakdown is available on the 30.7 million barrels of natural gas liquids which were blended with gasoline at terminal facilities away from the refineries in 1964; therefore it has been omitted from the production figures. This roughly offsets the omission of offshore military shipments in consumption data.

Gasoline deliveries by pipeline in 1964 (924,637,000 barrels) were greater than the corresponding 1963 deliveries by 137,223,000 barrels. A new products pipeline company began operating in September 1963. The line runs from the gulf coast to the vicinity of New York City. Tidewater shipments of gasoline from the gulf to the east coast were 216,337,000 barrels in 1964, compared with 245,508,000 barrels in 1963. A small quantity of gasoline (19,000 barrels) was shipped by water from the west coast to the east coast. Interdistrict barge shipments of gasoline on the Mississippi River totaled 44,635,000 barrels in 1964, a decline of 8,930,000 barrels for the year. Gasoline shipments from the gulf to the west coast were 5.9 million barrels greater than in 1963. Data on intradistrict barge shipments are not available.

Stocks of gasoline and naphtha increased at an average rate of 23,429 barrels daily during 1964 and at the end of the year totaled 199,512,000 barrels. This includes stocks held at the refineries and at bulk terminals operated by refineries and pipeline companies but does not include stocks held by secondary distributors and consumers nor those in military custody. The Bureau of Mines definition of a bulk-terminal installation is any storage facility operated by a refining or pipeline company which receives its principal products by tanker, barge, or pipeline or any storage point which has a combined capacity for storing refined products of 50,000 barrels or more regardless of transportation means by which products are received.

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**TABLE 33.—Salient statistics of aviation gasoline in the United States in 1964,[1] by months and total for 1963**

(Thousand barrels)

| Item | 1964 | | | | | | | | | | | | | 1963 total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | March | April | May | June | July | August | September | October | November | December | Total | |
| Production: | | | | | | | | | | | | | | |
| By grades: | | | | | | | | | | | | | | |
| Military 115/145 | 1,430 | 1,367 | 2,000 | 1,312 | 1,774 | 1,670 | 1,491 | 1,317 | 1,806 | 1,421 | 1,630 | 1,977 | 19,195 | 17,147 |
| Military 100/130 | 22 | 27 | 18 | 17 | 34 | 13 | 26 | 20 | 25 | 23 | 8 | 41 | 274 | 324 |
| Commercial 115/145 | 1,168 | 1,128 | 868 | 1,009 | 705 | 993 | 979 | 944 | 926 | 942 | 900 | 1,011 | 11,573 | 17,760 |
| Commercial 100/130 | 905 | 1,047 | 829 | 1,089 | 830 | 1,130 | 1,081 | 1,013 | 1,112 | 999 | 1,036 | 998 | 12,069 | 11,519 |
| 91/98 | 52 | 7 | 17 | 19 | 36 | 30 | 3 | 13 | 9 | 24 | 8 | 13 | 231 | 464 |
| Other grades (including commercial 108/135) | 157 | 273 | 192 | 267 | 311 | 262 | 464 | 399 | 380 | 357 | 198 | 283 | 3,543 | 3,624 |
| Alkylate (net) [2] | 6,297 | 6,125 | 6,717 | 6,510 | 6,828 | 6,665 | 7,688 | 7,860 | 6,979 | 6,345 | 6,360 | 6,564 | 80,938 | 73,358 |
| Total | 10,031 | 9,974 | 10,641 | 10,223 | 10,518 | 10,763 | 11,732 | 11,566 | 11,237 | 10,111 | 10,140 | 10,887 | 127,823 | 124,196 |
| Transfers out: [3] | | | | | | | | | | | | | | |
| Alkylate | 5,347 | 5,216 | 6,350 | 6,062 | 6,455 | 6,515 | 7,304 | 7,173 | 6,778 | 5,815 | 5,293 | 5,670 | 73,978 | 69,987 |
| Finished avgas | 37 | 66 | 33 | 263 | 79 | 41 | 66 | 56 | 90 | 76 | 44 | 31 | 882 | 900 |
| Total | 5,384 | 5,282 | 6,383 | 6,325 | 6,534 | 6,556 | 7,370 | 7,229 | 6,868 | 5,891 | 5,337 | 5,701 | 74,860 | 70,887 |
| Exports from: | | | | | | | | | | | | | | |
| District 1 | 36 | 24 | 5 | 43 | 45 | 5 | 57 | 44 | 5 | 63 | 1 | 8 | 336 | 293 |
| District 2 | | | 1 | 8 | 2 | 1 | 1 | 1 | 5 | | | 3 | 22 | 125 |
| District 3 | 367 | 131 | 436 | 134 | 298 | 297 | 459 | 510 | 258 | 451 | 443 | 595 | 4,379 | 3,669 |
| District 4 | | | | | | | | | | | | | | |
| District 5 | 25 | 51 | 133 | 10 | 7 | 237 | 122 | 5 | 52 | 6 | 19 | 23 | 690 | 556 |
| Total | 428 | 206 | 575 | 195 | 352 | 540 | 639 | 560 | 320 | 520 | 463 | 629 | 5,427 | 4,643 |
| Stocks: | | | | | | | | | | | | | | |
| By grades: | | | | | | | | | | | | | | |
| Military 115/145 | 907 | 1,144 | 1,254 | 1,151 | 1,356 | 782 | 939 | 762 | 757 | 766 | 839 | 735 | 735 | 1,152 |
| Military 100/130 | 40 | 47 | 47 | 41 | 53 | 43 | 41 | 45 | 44 | 45 | 28 | 52 | 52 | 34 |
| Commercial 115/145 | 2,396 | 2,582 | 2,282 | 2,334 | 2,003 | 2,142 | 2,113 | 2,101 | 1,846 | 1,804 | 1,867 | 1,945 | 1,945 | 2,285 |
| Commercial 100/130 | 2,062 | 2,174 | 1,964 | 2,049 | 1,843 | 1,935 | 1,932 | 1,906 | 1,896 | 1,960 | 2,047 | 2,103 | 2,103 | 2,129 |
| 91/98 | 236 | 218 | 203 | 196 | 193 | 194 | 171 | 153 | 133 | 135 | 127 | 119 | 119 | 217 |
| Other grades (including commercial 108/135) | 834 | 845 | 784 | 767 | 743 | 640 | 706 | 721 | 696 | 726 | 692 | 772 | 772 | 867 |
| Alkylate | 3,256 | 3,803 | 3,779 | 3,768 | 3,706 | 3,477 | 3,110 | 3,226 | 3,108 | 2,652 | 3,116 | 3,345 | 3,345 | 2,707 |
| Total | 9,731 | 10,813 | 10,313 | 10,306 | 9,897 | 9,213 | 9,012 | 8,914 | 8,480 | 8,088 | 8,716 | 9,071 | 9,071 | 9,391 |

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| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Domestic demand: All grades (including alkylate) | 3,879 | 3,404 | 4,183 | 3,710 | 4,041 | 4,351 | 3,924 | 3,875 | 4,483 | 4,092 | 3,712 | 4,202 | 47,856 | 50,157 |
| Total demand: All grades (including alkylate) | 4,307 | 3,610 | 4,758 | 3,905 | 4,393 | 4,891 | 4,563 | 4,435 | 4,803 | 4,612 | 4,175 | 4,831 | 53,283 | 54,800 |
| Deliveries: | | | | | | | | | | | | | | |
| To U.S. military: | | | | | | | | | | | | | | |
| Military 115/145 | 1,464 | 997 | 1,559 | 1,072 | 1,170 | 1,994 | 1,051 | 1,337 | 1,419 | 1,137 | 1,437 | 1,789 | 16,426 | 15,051 |
| Military 100/130 | 3 | 3 | 3 | 1 | 3 | 4 | 4 | --- | 7 | 4 | 3 | 3 | 38 | 48 |
| Commercial 115/145 | 259 | 135 | 142 | 395 | 349 | 212 | 395 | 219 | 484 | 289 | 259 | 217 | 3,355 | 6,452 |
| Commercial 100/130 | 3 | 4 | 3 | 5 | 4 | 4 | 3 | 2 | 6 | 31 | 7 | 2 | 74 | 86 |
| 91/98 | 5 | 4 | 4 | --- | 1 | 2 | 2 | --- | 1 | 1 | 2 | 1 | 23 | 103 |
| Other grades (including commercial 108/135) | 33 | 34 | 31 | --- | 1 | 3 | 6 | 4 | 5 | 16 | 7 | 6 | 146 | 518 |
| Total | 1,767 | 1,177 | 1,742 | 1,473 | 1,528 | 2,219 | 1,461 | 1,562 | 1,922 | 1,478 | 1,715 | 2,018 | 20,062 | 22,258 |
| To other consumers and exports: | | | | | | | | | | | | | | |
| Military 115/145 | 200 | 128 | 330 | 160 | 391 | 234 | 256 | 141 | 335 | 234 | 119 | 281 | 2,809 | 2,460 |
| Military 100/130 | 13 | 17 | 15 | 22 | 19 | 19 | 23 | 16 | 18 | 17 | 22 | 14 | 215 | 343 |
| Commercial 115/145 | 792 | 802 | 1,012 | 556 | 685 | 640 | 609 | 735 | 692 | 688 | 551 | 712 | 8,474 | 11,364 |
| Commercial 100/130 | 966 | 890 | 1,022 | 948 | 976 | 1,027 | 1,070 | 1,024 | 1,109 | 888 | 941 | 931 | 11,792 | 11,413 |
| 91/98 | 22 | 22 | 28 | 22 | 38 | 26 | 22 | 19 | 16 | 20 | 14 | 15 | 264 | 430 |
| Other grades (including commercial 108/135) | 146 | 212 | 218 | 265 | 321 | 347 | 371 | 367 | 392 | 301 | 210 | 195 | 3,345 | 2,829 |
| Alkylate | 401 | 362 | 391 | 459 | 435 | 379 | 751 | 571 | 319 | 986 | 603 | 665 | 6,322 | 3,703 |
| Total | 2,540 | 2,433 | 3,016 | 2,432 | 2,865 | 2,672 | 3,102 | 2,873 | 2,881 | 3,134 | 2,460 | 2,813 | 33,221 | 32,542 |
| Shipments originating in— | | | | | | | | | | | | | | |
| District 1 | 194 | 169 | 126 | 119 | 167 | 168 | 169 | 206 | 258 | 268 | 67 | 53 | 1,964 | 2,159 |
| District 2 | 394 | 390 | 448 | 529 | 427 | 438 | 474 | 426 | 449 | 506 | 325 | 393 | 5,199 | 6,157 |
| District 3 | 2,575 | 2,331 | 2,987 | 2,203 | 2,800 | 2,824 | 2,952 | 2,666 | 2,878 | 2,937 | 2,884 | 3,218 | 33,255 | 33,595 |
| District 4 | 100 | 79 | 92 | 68 | 193 | 103 | 93 | 98 | 106 | 92 | 74 | 80 | 1,178 | 1,238 |
| District 5 | 1,044 | 641 | 1,105 | 986 | 806 | 1,358 | 875 | 1,039 | 1,112 | 809 | 825 | 1,087 | 11,687 | 11,651 |
| Total | 4,307 | 3,610 | 4,758 | 3,905 | 4,393 | 4,891 | 4,563 | 4,435 | 4,803 | 4,612 | 4,175 | 4,831 | 53,283 | 54,800 |

[1] Included in gasoline figures in other tables of this report.
[2] Excludes alkylate produced and blended to finished avgas during the month.
[3] Represents alkylate and a small amount of finished avgas transferred or used in the production of other products, mainly automotive gasoline.

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**TABLE 34.—Salient statistics of gasoline and naphtha in the United States, 1963–64 by months and totals for 1962–63**

(Thousand barrels)

| | 1963 | | | | | | | | | | | | | 1962 total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | March | April | May | June | July | August | September | October | November | December | Total | |
| Production: | | | | | | | | | | | | | | |
| Finished gasoline from crude oil | 116,391 | 105,895 | 113,827 | 107,998 | 114,458 | 117,732 | 122,678 | 123,688 | 115,299 | 116,650 | 114,613 | 121,757 | 1,390,986 | 1,350,409 |
| Naphtha from crude oil | 1,867 | 1,516 | 1,919 | 1,686 | 1,782 | 1,880 | 1,979 | 2,091 | 1,822 | 2,041 | 1,913 | 2,191 | 22,687 | 37,297 |
| Total gasoline production from crude oil | 118,258 | 107,411 | 115,746 | 109,684 | 116,240 | 119,612 | 124,657 | 125,779 | 117,121 | 118,691 | 116,526 | 123,948 | 1,413,673 | 1,387,706 |
| Gasoline produced from natural gas liquids | 17,469 | 15,996 | 16,678 | 16,929 | 16,885 | 16,891 | 16,514 | 17,899 | 18,347 | 19,253 | 18,776 | 19,808 | 211,445 | 195,579 |
| Benzol blended | 7 | 6 | 7 | 10 | 7 | 6 | 7 | 7 | 6 | 7 | 5 | 5 | 80 | 91 |
| Total gasoline and naphtha production | 135,734 | 123,413 | 132,431 | 126,623 | 133,132 | 136,509 | 141,178 | 143,685 | 135,474 | 137,951 | 135,307 | 143,761 | 1,625,198 | 1,583,376 |
| Daily average | 4,379 | 4,408 | 4,272 | 4,221 | 4,295 | 4,550 | 4,554 | 4,635 | 4,516 | 4,450 | 4,510 | 4,637 | 4,453 | 4,338 |
| Imports | 1,589 | 750 | 1,487 | 1,923 | 1,060 | 1,488 | 1,068 | 1,242 | 1,848 | 1,569 | 932 | 1,189 | 16,145 | 13,878 |
| Exports | 409 | 750 | 447 | 637 | 237 | 557 | 439 | 559 | 663 | 764 | 674 | 850 | 6,986 | 6,592 |
| Daily average | 13 | 27 | 14 | 21 | 8 | 19 | 14 | 18 | 22 | 25 | 22 | 27 | 19 | 18 |
| Stocks, end of period: | | | | | | | | | | | | | | |
| Finished gasoline | 196,438 | 205,323 | 210,833 | 201,075 | 192,193 | 189,098 | 181,157 | 174,483 | 177,308 | 174,354 | 177,626 | 186,860 | 186,860 | 183,701 |
| Naphtha | 4,567 | 4,073 | 3,884 | 3,712 | 3,413 | 3,531 | 3,555 | 3,862 | 3,975 | 3,911 | 3,631 | 4,077 | 4,077 | 4,982 |
| Total stocks | 201,005 | 209,396 | 214,717 | 204,787 | 195,706 | 192,629 | 184,712 | 178,345 | 181,283 | 178,265 | 181,257 | 190,937 | 190,937 | 188,683 |
| Domestic demand | 124,592 | 115,022 | 128,150 | 137,839 | 143,036 | 140,517 | 149,724 | 150,735 | 133,721 | 141,774 | 132,573 | 134,420 | 1,632,103 | 1,584,691 |
| Daily average | 4,019 | 4,108 | 4,134 | 4,595 | 4,614 | 4,684 | 4,830 | 4,862 | 4,457 | 4,573 | 4,419 | 4,336 | 4,472 | 4,342 |

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| | ▷ 1964 | | | | | | | | | | | | | 1963 total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Production: | | | | | | | | | | | | | | |
| Finished gasoline from crude oil | 121,434 | 113,233 | 120,202 | 114,554 | 120,189 | 120,977 | 128,416 | 128,133 | 120,666 | 124,218 | 118,381 | 124,007 | 1,454,410 | 1,390,986 |
| Naphtha from crude oil | 1,929 | 2,245 | 1,938 | 2,394 | 2,363 | 2,092 | 2,488 | 2,293 | 1,826 | 2,112 | 2,089 | 2,109 | 25,878 | 22,087 |
| Total gasoline production from crude oil | 123,363 | 115,478 | 122,140 | 116,948 | 122,552 | 123,069 | 130,904 | 130,426 | 122,492 | 126,330 | 120,470 | 126,116 | 1,480,288 | 1,413,073 |
| Gasoline produced from natural gas liquids | 18,985 | 17,496 | 17,943 | 16,932 | 17,551 | 17,458 | 18,756 | 18,924 | 20,016 | 19,584 | 20,893 | 21,150 | 225,688 | 211,445 |
| Benzol blended | 9 | 3 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 1 | 1 | 3 | 29 | 80 |
| Total gasoline and naphtha production | 142,357 | 132,977 | 140,084 | 133,881 | 140,105 | 140,528 | 149,662 | 149,353 | 142,510 | 145,915 | 141,364 | 147,269 | 1,706,005 | 1,625,198 |
| Daily average | 4,592 | 4,585 | 4,519 | 4,463 | 4,519 | 4,684 | 4,828 | 4,818 | 4,750 | 4,707 | 4,712 | 4,750 | 4,661 | 4,453 |
| Imports | 1,040 | 1,069 | 1,492 | 1,430 | 1,557 | 1,218 | 918 | 1,099 | 1,344 | 1,165 | 908 | 1,386 | 14,626 | 16,145 |
| Exports | 586 | 373 | 787 | 375 | 549 | 684 | 997 | 822 | 529 | 728 | 664 | 848 | 7,942 | 6,986 |
| Daily average | 19 | 13 | 25 | 13 | 18 | 23 | 32 | 27 | 18 | 23 | 22 | 27 | 22 | 19 |
| Stocks, end of period: | | | | | | | | | | | | | | |
| Finished gasoline | 199,037 | 210,517 | 216,053 | 210,364 | 206,818 | 194,434 | 186,838 | 186,314 | 184,017 | 182,613 | 192,488 | 194,691 | 194,691 | 186,860 |
| Naphtha | 4,200 | 4,574 | 4,304 | 4,307 | 4,106 | 4,066 | 4,525 | 4,554 | 4,556 | 4,552 | 4,757 | 4,821 | 4,821 | 4,077 |
| Total stocks | 203,237 | 215,091 | 220,357 | 214,671 | 210,924 | 198,500 | 191,363 | 190,868 | 188,573 | 187,165 | 197,245 | 199,512 | 199,512 | 190,937 |
| Domestic demand | 130,511 | 121,819 | 135,523 | 140,622 | 144,860 | 153,486 | 156,720 | 150,125 | 145,620 | 147,760 | 131,528 | 145,540 | 1,704,114 | 1,632,103 |
| Daily average | 4,210 | 4,201 | 4,372 | 4,687 | 4,673 | 5,116 | 5,054 | 4,843 | 4,854 | 4,766 | 4,384 | 4,695 | 4,656 | 4,472 |

▷ Preliminary.

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**TABLE 35.—Production of gasoline and naphtha at refineries in the United States in 1964 [p], by districts and months**

(Thousand barrels)

| | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gasoline from crude oil: | | | | | | | | | | | | | |
| East Coast | 17,000 | 15,658 | 16,275 | 15,386 | 16,932 | 17,051 | 18,012 | 17,555 | 16,471 | 16,913 | 16,588 | 16,757 | 200,598 |
| Appalachian No. 1 | 1,399 | 1,271 | 1,361 | 1,350 | 1,402 | 1,279 | 1,380 | 1,142 | 1,413 | 1,429 | 1,290 | 1,438 | 16,154 |
| Appalachian No. 2 | 1,497 | 1,384 | 1,531 | 1,465 | 1,557 | 1,614 | 1,629 | 1,708 | 1,581 | 1,612 | 1,471 | 1,599 | 18,648 |
| Indiana, Illinois, Kentucky, etc | 24,151 | 22,944 | 23,819 | 22,597 | 22,363 | 23,141 | 25,291 | 25,705 | 24,576 | 25,230 | 23,639 | 24,415 | 287,871 |
| Minnesota, Wisconsin, etc | 2,121 | 2,129 | 2,055 | 2,190 | 1,632 | 2,201 | 2,323 | 2,294 | 2,108 | 2,092 | 2,091 | 2,266 | 25,502 |
| Oklahoma, Kansas, etc | 11,411 | 11,187 | 11,583 | 10,231 | 11,538 | 11,950 | 12,005 | 12,484 | 11,080 | 11,210 | 11,939 | 12,524 | 139,142 |
| Texas Inland | 4,723 | 4,107 | 4,381 | 4,129 | 4,687 | 4,315 | 4,663 | 4,509 | 4,372 | 4,554 | 4,244 | 4,734 | 53,418 |
| Texas Gulf Coast | 25,341 | 22,988 | 25,509 | 24,640 | 26,081 | 25,472 | 27,686 | 27,202 | 24,301 | 26,006 | 24,516 | 25,518 | 305,260 |
| Louisiana Gulf Coast | 11,039 | 10,628 | 11,716 | 11,606 | 12,003 | 11,614 | 12,335 | 12,105 | 11,837 | 11,797 | 10,453 | 11,218 | 138,351 |
| Arkansas, Louisiana Inland, etc | 1,365 | 1,331 | 1,372 | 1,211 | 1,336 | 1,368 | 1,382 | 1,435 | 1,376 | 1,464 | 1,340 | 1,483 | 16,463 |
| New Mexico | 434 | 382 | 471 | 380 | 433 | 449 | 516 | 517 | 454 | 495 | 451 | 476 | 5,458 |
| Rocky Mountain | 4,312 | 3,994 | 4,214 | 3,629 | 4,355 | 4,517 | 4,664 | 4,425 | 4,576 | 4,594 | 4,437 | 4,643 | 52,360 |
| West Coast | 16,641 | 15,230 | 15,915 | 15,740 | 15,870 | 16,006 | 16,530 | 17,052 | 16,521 | 16,822 | 15,922 | 16,936 | 195,185 |
| Total gasoline from crude | 121,434 | 113,233 | 120,202 | 114,554 | 120,189 | 120,977 | 128,416 | 128,133 | 120,666 | 124,218 | 118,381 | 124,007 | 1,454,410 |
| Natural gas liquids blended at refineries: | | | | | | | | | | | | | |
| East Coast | 279 | 429 | 396 | 235 | 308 | 544 | 484 | 568 | 435 | 410 | 401 | 640 | 5,129 |
| Appalachian No. 1 | 1 | 1 | 1 | | | | | 2 | 2 | 1 | 2 | 2 | 12 |
| Appalachian No. 2 | 112 | 75 | 82 | 55 | 27 | 41 | 42 | 41 | 51 | 94 | 113 | 118 | 851 |
| Indiana, Illinois, Kentucky, etc | 1,805 | 1,441 | 1,196 | 1,288 | 1,271 | 1,044 | 1,021 | 1,144 | 1,522 | 1,944 | 1,973 | 2,255 | 17,904 |
| Minnesota, Wisconsin, etc | 162 | 146 | 103 | 102 | 77 | 153 | 182 | 196 | 187 | 208 | 242 | 195 | 1,953 |
| Oklahoma, Kansas, etc | 1,812 | 1,446 | 1,518 | 1,302 | 1,485 | 1,488 | 1,499 | 1,488 | 1,560 | 1,706 | 1,893 | 2,017 | 19,214 |
| Texas Inland | 1,967 | 1,755 | 1,855 | 2,013 | 2,196 | 2,005 | 2,106 | 2,302 | 2,124 | 2,003 | 1,857 | 1,840 | 24,023 |
| Texas Gulf Coast | 5,596 | 5,485 | 5,701 | 5,686 | 5,643 | 5,157 | 5,828 | 5,878 | 6,222 | 6,199 | 6,389 | 6,298 | 70,082 |
| Louisiana Gulf Coast | 1,224 | 1,217 | 1,348 | 1,343 | 1,271 | 1,380 | 1,468 | 1,497 | 1,589 | 1,710 | 1,832 | 1,901 | 17,780 |
| Arkansas, Louisiana Inland, etc | 656 | 610 | 641 | 605 | 680 | 619 | 600 | 601 | 644 | 708 | 697 | 684 | 7,745 |
| New Mexico | 106 | 88 | 93 | 83 | 108 | 150 | 130 | 127 | 121 | 123 | 102 | 81 | 1,312 |
| Rocky Mountain | 402 | 342 | 344 | 319 | 337 | 323 | 321 | 361 | 374 | 381 | 423 | 371 | 4,298 |
| West Coast | 1,981 | 1,921 | 1,981 | 1,881 | 1,968 | 1,960 | 2,043 | 2,090 | 2,241 | 2,112 | 2,123 | 2,357 | 24,658 |
| Total natural gas liquids blended | 16,103 | 14,956 | 15,259 | 14,912 | 15,371 | 14,864 | 15,724 | 16,295 | 17,072 | 17,599 | 18,047 | 18,759 | [1] 194,961 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Benzol blended | | | | | | | | | | | | | |
| Total gasoline produced at refineries | 9 137,546 | 3 128,192 | 1 135,462 | 1 129,467 | 2 135,562 | 1 135,842 | 2 144,142 | 3 144,431 | 2 137,740 | 1 141,818 | 1 136,429 | 3 142,769 | 29 1,649,400 |
| Naphtha from crude oil: | | | | | | | | | | | | | |
| East Coast | 122 | 131 | 128 | 168 | 111 | 132 | 94 | 131 | 115 | 131 | 156 | 92 | 1,511 |
| Appalachian No. 1 | 35 | 27 | 39 | 36 | 43 | 44 | 31 | 38 | 33 | 39 | 45 | 28 | 438 |
| Appalachian No. 2 | 14 | 11 | 14 | 13 | 18 | 16 | 18 | 16 | 15 | 14 | 11 | 12 | 172 |
| Indiana, Illinois, Kentucky, etc | 252 | 326 | 271 | 281 | 415 | 304 | 263 | 394 | 349 | 261 | 275 | 318 | 3,709 |
| Minnesota, Wisconsin, etc | | | | | | | | | | | | | |
| Oklahoma, Kansas, etc | 133 | 137 | 156 | 172 | 201 | 193 | 165 | 183 | 133 | 167 | 166 | 162 | 1,968 |
| Texas Inland | 32 | 32 | 29 | 26 | 30 | 27 | 34 | 38 | 36 | 30 | 30 | 27 | 371 |
| Texas Gulf Coast | 989 | 1,003 | 922 | 1,106 | 1,151 | 1,011 | 1,085 | 1,120 | 852 | 1,191 | 1,003 | 1,168 | 12,661 |
| Louisiana Gulf Coast | 69 | 34 | 44 | 72 | 65 | 77 | 65 | 23 | 38 | 71 | 42 | 57 | 657 |
| Arkansas, Louisiana Inland, etc | 82 | 64 | 66 | 68 | 71 | 50 | 78 | 62 | 64 | 66 | 49 | 55 | 775 |
| New Mexico | | | | | | | | | | | | | |
| Rocky Mountain | 18 | 18 | 10 | 8 | 25 | 12 | 15 | 12 | 6 | 18 | 14 | 7 | 163 |
| West Coast | 183 | 462 | 259 | 444 | 233 | 226 | 640 | 276 | 185 | 124 | 238 | 183 | 3,453 |
| Total naphtha from crude oil | 1,929 | 2,245 | 1,938 | 2,394 | 2,363 | 2,092 | 2,488 | 2,293 | 1,826 | 2,112 | 2,089 | 2,109 | 26,878 |
| Total gasoline and naphtha produced at refineries | 139,475 | 130,437 | 137,400 | 131,861 | 137,925 | 137,934 | 146,630 | 146,724 | 139,566 | 143,930 | 138,518 | 144,878 | 1,675,278 |

p Preliminary figures.
1 Excludes gasoline blended at terminal facilities.



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The dealer's average net price for regular-grade gasoline (exclusive of dealer's margin and sales tax) in 55 representative cities in the United States provides an index of wholesale gasoline prices. The average service station price (excluding taxes) decreased from 20.11 cents per gallon in 1963 to 19.98 cents per gallon in 1964. The average tax on gasoline in 1964 was 10.37 cents per gallon. Federal tax was 4.0 cents per gallon; State taxes, including some local taxes, averaged 6.33 cents per gallon.

**TABLE 36.—Consumption, production, and distribution[1] of gasoline in 1964, by PAD districts**

(Million barrels)

| | PAD districts | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | Total |
| Consumption[2] | 615.1 | 559.2 | 224.5 | 49.2 | 250.1 | 1,698.1 |
| Supply: | | | | | | |
| Production[3] | 221.9 | 511.1 | 640.0 | 56.6 | 219.8 | 1,649.4 |
| Imports | 12.8 | | .4 | | 1.4 | 14.6 |
| Received from other districts: | | | | | | |
| From district 1 | | 23.3 | .1 | | | |
| From district 2 | 3.7 | | 14.3 | .1 | | |
| From district 3 | 333.1 | 75.2 | | 4.4 | 17.2 | |
| From district 4 | | 4.1 | | | 7.5 | |
| From district 5 | | | | .5 | | |
| Total Receipts | 336.8 | 102.6 | 14.4 | 5.0 | 24.7 | |
| Total Supply | 571.5 | 613.7 | 654.8 | 61.6 | 245.9 | 1,664.0 |
| Stock change[4] | +1.3 | +2.1 | +4.8 | +.3 | −.7 | +7.8 |
| Shipped to other districts | 23.4 | 18.1 | 429.9 | 11.6 | .5 | |
| Exports | .9 | .5 | 5.4 | | 1.1 | 7.9 |
| Domestic demand | 545.9 | 593.0 | 214.7 | 49.7 | 245.0 | 1,648.3 |
| Difference between consumption and demand | +69.2 | −33.8 | +9.8 | −.5 | +5.1 | +49.8 |

[1] Apparent distribution of gasoline by districts is based on actual data on tidewater and river shipments (for the first half of 1964) compiled by the Geological Survey, U.S. Department of the Interior and the last half by the Bureau of Mines. An estimate of annual interdistrict railroad shipments was computed from 1961 data compiled by the Bureau of Transport Economics, Interstate Commerce Commission, and records compiled by the San Francisco office of the Bureau of Mines. Interdistrict pipeline shipments are compiled by the Bureau of Mines. Information on shipments moving from PAD district 2 by way of the Great Lakes ports and the Ohio River to PAD district 1 were compiled from data supplied by the U.S. Army Corps of Engineers.

[2] Compiled by the American Petroleum Institute.

[3] Excludes naphtha production and gasoline blended at terminal facilities.

[4] Excludes naphtha.

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**TABLE 37.—Production (refinery output) and consumption of gasoline (excluding naphtha) in the United States, by States**

(Thousand barrels)

| | 1962 | | 1963 | | p 1964 | |
|---|---|---|---|---|---|---|
| | Production | Consumption [1] | Production | Consumption [1] | Production | Consumption [1] |
| Alabama | (2) | 25,913 | (2) | 26,777 | (2) | 28,374 |
| Alaska | | 1,697 | | 1,624 | | 1,757 |
| Arizona | | 13,626 | | 14,288 | | 14,948 |
| Arkansas | 12,168 | 16,038 | 12,697 | 16,824 | 12,895 | 17,616 |
| California | [3] 205,837 | 154,958 | [3] 214,726 | 162,945 | [3] 219,843 | 173,178 |
| Colorado | 6,991 | 18,191 | 7,051 | 18,458 | 5,867 | 18,343 |
| Connecticut | | 20,364 | | 21,249 | | 22,117 |
| Delaware | (4) | 5,292 | (4) | 5,464 | (4) | 5,502 |
| District of Columbia | | 5,174 | | 4,956 | | 5,263 |
| Florida | | 48,084 | | 50,164 | | 52,729 |
| Georgia | (5) | 34,250 | (5) | 35,690 | (5) | 37,923 |
| Hawaii | (3) | 4,581 | (3) | 4,490 | (3) | 4,414 |
| Idaho | | 7,131 | | 7,191 | | 7,461 |
| Illinois | 107,708 | 79,629 | 112,187 | 81,966 | 117,746 | 84,671 |
| Indiana | 72,219 | 44,404 | 72,606 | 45,608 | 78,268 | 47,355 |
| Iowa | | 29,074 | | 29,983 | | 30,467 |
| Kansas | 63,825 | 26,851 | 65,329 | 27,233 | 66,088 | 26,827 |
| Kentucky | [6] 15,209 | 23,377 | [6] 16,188 | 24,395 | [6] 17,524 | 25,409 |
| Louisiana | [2] 152,491 | 24,342 | [2] 147,659 | 24,959 | [2] 167,444 | 26,868 |
| Maine | | 8,379 | | 8,564 | | 8,902 |
| Maryland | (5) | 23,959 | (5) | 25,355 | (5) | 26,467 |
| Massachusetts | [4] 27,154 | 36,403 | [4] 22,388 | 37,458 | [4] 23,198 | 38,899 |
| Michigan | 21,431 | 67,857 | 23,710 | 71,542 | 24,989 | 75,757 |
| Minnesota | 11,945 | 33,344 | 12,725 | 34,348 | 15,027 | 35,216 |
| Mississippi | (2) | 16,989 | (2) | 17,999 | (2) | 18,517 |
| Missouri | [7] 13,594 | 42,959 | [7] 12,439 | 43,983 | [7] 14,206 | 45,182 |
| Montana | 11,943 | 8,753 | 12,733 | 8,848 | 15,304 | 8,631 |
| Nebraska | (7) | 15,523 | (7) | 16,011 | (7) | 16,549 |
| Nevada | | 4,655 | | 5,132 | | 5,413 |
| New Hampshire | | 5,117 | | 5,321 | | 5,609 |
| New Jersey | 62,044 | 50,228 | 78,639 | 52,832 | 77,958 | 54,316 |
| New Mexico | 5,416 | 10,098 | 5,837 | 10,619 | 6,770 | 10,953 |
| New York | 11,909 | 112,743 | 12,696 | 117,586 | 14,056 | 123,252 |
| North Carolina | | 38,157 | | 40,119 | | 42,446 |
| North Dakota | [8] 10,888 | 7,786 | [8] 11,722 | 8,017 | [8] 12,428 | 8,316 |
| Ohio | 76,054 | 80,688 | 82,851 | 81,547 | 86,754 | 85,539 |
| Oklahoma | 74,292 | 27,848 | 74,689 | 28,278 | 78,062 | 28,741 |
| Oregon | | 17,501 | | 18,029 | | 19,056 |
| Pennsylvania | 92,993 | 79,610 | 95,484 | 81,268 | 99,647 | 84,269 |
| Rhode Island | (4) | 6,079 | (4) | 6,270 | (4) | 6,415 |
| South Carolina | (5) | 18,744 | (5) | 19,472 | (5) | 20,345 |
| South Dakota | | 8,943 | | 9,320 | | 9,117 |
| Tennessee | (6) | 29,411 | (6) | 30,663 | (6) | 32,596 |
| Texas | 436,740 | 117,287 | 444,928 | 115,949 | 452,783 | 122,243 |
| Utah | 16,332 | 9,152 | 16,536 | 9,481 | 17,650 | 10,047 |
| Vermont | | 3,347 | | 3,468 | | 3,590 |
| Virginia | [5] 6,418 | 33,070 | [5] 6,752 | 34,276 | [5] 6,482 | 36,279 |
| Washington | (3) | 30,153 | (3) | 30,004 | (3) | 31,328 |
| West Virginia | 716 | 11,790 | 731 | 12,101 | 555 | 12,407 |
| Wisconsin | (8) | 33,430 | (8) | 34,352 | (8) | 35,726 |
| Wyoming | 16,939 | 4,544 | 17,906 | 4,728 | 17,856 | 4,800 |
| Total | 1,533,256 | 1,577,523 | 1,581,209 | 1,627,204 | 1,649,400 | 1,698,145 |

p Preliminary.
[1] American Petroleum Institute.
[2] Alabama and Mississippi included with Louisiana.
[3] Washington and Hawaii included with California.
[4] Delaware and Rhode Island included with Massachusetts.
[5] Maryland, South Carolina, and Georgia included with Virginia.
[6] Tennessee included with Kentucky.
[7] Nebraska included with Missouri.
[8] Wisconsin included with North Dakota.

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**TABLE 38.—Stocks of gasoline and naphtha in the United States in 1964 by districts and months**

(Thousand barrels)

| | Jan. 31 | Feb. 29 | Mar. 31 | Apr. 30 | May 31 | June 30 | July 31 | Aug. 31 | Sept. 30 | Oct. 31 | Nov. 30 | Dec. 31 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gasoline:[1] | | | | | | | | | | | | |
| East Coast | 46,081 | 48,389 | 48,471 | 48,623 | 50,242 | 49,773 | 47,871 | 46,680 | 47,073 | 44,771 | 49,629 | 47,690 |
| Appalachian No. 1 | 5,174 | 5,593 | 5,605 | 5,407 | 5,365 | 5,269 | 4,968 | 5,054 | 5,327 | 5,009 | 5,658 | 5,611 |
| Appalachian No. 2 | 3,232 | 3,479 | 3,365 | 3,216 | 3,151 | 3,082 | 2,954 | 3,201 | 3,235 | 2,852 | 3,240 | 3,050 |
| Indiana, Illinois, Kentucky, etc | 34,153 | 37,939 | 40,361 | 39,213 | 36,266 | 32,625 | 30,671 | 31,395 | 32,137 | 31,309 | 32,273 | 33,363 |
| Minnesota, Wisconsin, North Dakota and South Dakota | 7,308 | 7,374 | 8,139 | 8,027 | 7,879 | 7,851 | 7,634 | 7,223 | 6,848 | 6,643 | 7,606 | 7,539 |
| Oklahoma, Kansas, etc | 19,772 | 21,338 | 21,270 | 20,764 | 19,551 | 18,302 | 16,889 | 16,934 | 15,704 | 15,090 | 16,800 | 17,746 |
| Texas Inland | 8,167 | 8,214 | 8,805 | 8,462 | 8,560 | 7,401 | 6,680 | 6,566 | 6,769 | 6,986 | 7,403 | 8,270 |
| Texas Gulf Coast | 25,273 | 26,925 | 26,416 | 24,690 | 22,627 | 20,222 | 23,331 | 22,984 | 22,940 | 23,069 | 23,195 | 24,118 |
| Louisiana Gulf Coast | 10,696 | 12,229 | 12,643 | 12,451 | 12,966 | 11,904 | 12,552 | 11,865 | 11,994 | 13,652 | 11,373 | 10,748 |
| Arkansas, Louisiana Inland, etc | 9,630 | 8,161 | 9,423 | 9,173 | 8,303 | 8,887 | 5,997 | 8,885 | 7,063 | 8,093 | 8,522 | 8,438 |
| New Mexico | 797 | 730 | 810 | 792 | 711 | 626 | 718 | 779 | 800 | 792 | 781 | 700 |
| Rocky Mountain | 6,677 | 7,437 | 7,818 | 7,437 | 7,426 | 6,903 | 5,863 | 4,857 | 4,754 | 4,681 | 5,348 | 6,108 |
| West Coast | 22,077 | 22,709 | 22,927 | 22,109 | 23,771 | 21,589 | 20,710 | 19,891 | 19,373 | 19,666 | 20,660 | 21,310 |
| Total gasoline | 199,037 | 210,517 | 216,053 | 210,364 | 206,818 | 194,434 | 186,838 | 186,314 | 184,017 | 182,613 | 192,488 | 194,691 |
| Naphtha: | | | | | | | | | | | | |
| East Coast | 611 | 660 | 649 | 613 | 631 | 604 | 615 | 515 | 526 | 460 | 616 | 583 |
| Appalachian No. 1 | 70 | 71 | 90 | 84 | 90 | 94 | 86 | 84 | 78 | 81 | 89 | 93 |
| Appalachian No. 2 | 21 | 18 | 18 | 16 | 17 | 17 | 18 | 18 | 16 | 15 | 16 | 17 |
| Indiana, Illinois, Kentucky, etc | 611 | 639 | 547 | 479 | 560 | 555 | 482 | 582 | 654 | 594 | 569 | 605 |
| Minnesota, Wisconsin, North Dakota and South Dakota | 238 | 250 | 238 | 197 | 227 | 225 | 231 | 245 | 203 | 204 | 227 | 263 |
| Oklahoma, Kansas, etc | 32 | 36 | 31 | 24 | 23 | 23 | 23 | 24 | 29 | 29 | 25 | 21 |
| Texas Inland | 1,570 | 1,564 | 1,368 | 1,373 | 1,287 | 1,273 | 1,368 | 1,336 | 1,373 | 1,507 | 1,468 | 1,485 |
| Texas Gulf Coast | 93 | 88 | 86 | 92 | 93 | 124 | 128 | 113 | 101 | 114 | 127 | 143 |
| Louisiana Gulf Coast | 126 | 143 | 150 | 124 | 88 | 60 | 71 | 68 | 74 | 78 | 82 | 87 |
| Arkansas, Louisiana Inland, etc | | | | | | | | | | | | |
| New Mexico | | | | | | | | | | | | |
| Rocky Mountain | 41 | 47 | 50 | 32 | 47 | 47 | 48 | 37 | 23 | 27 | 33 | 32 |
| West Coast | 787 | 1,058 | 1,077 | 1,273 | 1,043 | 1,044 | 1,455 | 1,532 | 1,479 | 1,443 | 1,505 | 1,492 |
| Total naphtha | 4,200 | 4,574 | 4,304 | 4,307 | 4,106 | 4,066 | 4,525 | 4,554 | 4,556 | 4,552 | 4,757 | 4,821 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total gasoline and naphtha: | | | | | | | | | | | | |
| East Coast | 40,692 | 49,049 | 49,120 | 49,286 | 50,873 | 50,377 | 48,486 | 47,196 | 47,599 | 45,231 | 50,245 | 48,273 |
| Appalachian No. 1 | 5,244 | 5,664 | 5,666 | 5,491 | 5,455 | 5,363 | 5,054 | 5,138 | 5,405 | 5,060 | 5,747 | 5,704 |
| Appalachian No. 2 | 3,253 | 3,497 | 3,383 | 3,252 | 3,168 | 3,090 | 2,972 | 3,219 | 3,251 | 2,867 | 3,256 | 3,067 |
| Indiana, Illinois, Kentucky, etc | 34,704 | 38,578 | 40,908 | 39,662 | 36,826 | 33,180 | 31,153 | 31,977 | 32,791 | 31,903 | 32,843 | 33,908 |
| Minnesota, Wisconsin, North Dakota and South Dakota | 7,306 | 7,374 | 8,139 | 8,027 | 7,879 | 7,851 | 7,634 | 7,223 | 6,848 | 6,643 | 7,006 | 7,539 |
| Oklahoma, Kansas, etc | 20,010 | 21,588 | 21,508 | 20,961 | 19,778 | 18,527 | 17,120 | 17,179 | 16,907 | 16,294 | 17,027 | 18,009 |
| Texas Inland | 8,199 | 8,220 | 8,586 | 8,496 | 8,583 | 7,424 | 6,703 | 6,590 | 6,798 | 7,015 | 7,428 | 8,201 |
| Texas Gulf Coast | 26,843 | 28,460 | 27,784 | 26,063 | 23,914 | 21,496 | 24,699 | 24,320 | 24,313 | 24,576 | 24,663 | 25,603 |
| Louisiana Gulf Coast | 10,789 | 12,317 | 12,729 | 12,543 | 13,059 | 12,028 | 12,660 | 11,978 | 12,095 | 13,766 | 11,500 | 10,891 |
| Arkansas, Louisiana Inland, etc | 9,756 | 8,304 | 9,573 | 9,297 | 8,391 | 8,947 | 6,068 | 8,453 | 7,137 | 8,171 | 8,604 | 8,525 |
| New Mexico | 797 | 730 | 810 | 792 | 711 | 626 | 713 | 779 | 800 | 792 | 781 | 700 |
| Rocky Mountain | 6,718 | 7,494 | 7,868 | 7,469 | 7,473 | 6,950 | 5,911 | 4,894 | 4,777 | 4,708 | 5,381 | 6,140 |
| West Coast | 22,804 | 23,767 | 24,004 | 23,382 | 24,814 | 22,633 | 22,165 | 21,423 | 20,852 | 21,109 | 22,165 | 22,802 |
| Total: 1964 | 203,237 | 215,091 | 220,357 | 214,671 | 210,924 | 198,500 | 191,363 | 190,868 | 188,573 | 187,165 | 197,245 | 199,512 |
| 1963 | 201,005 | 209,396 | 214,717 | 204,787 | 195,706 | 192,629 | 184,712 | 178,345 | 181,283 | 178,265 | 181,257 | 190,987 |

[1] Includes stocks of gasoline at refineries, bulk terminals, and in pipelines.

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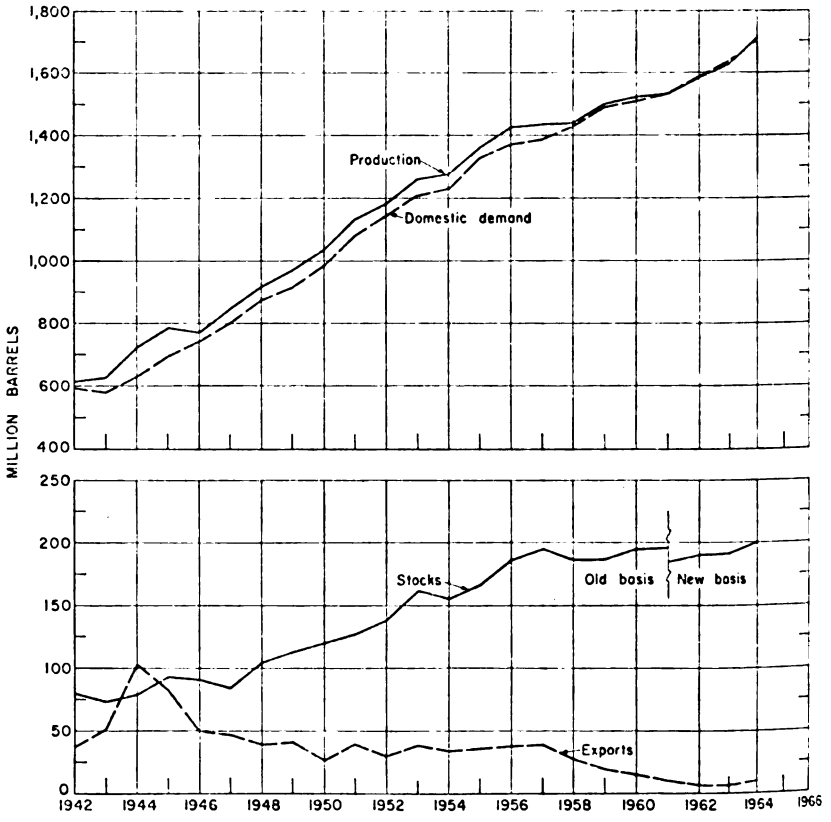


FIGURE 8.—Production, domestic demand, exports, and stocks of gasoline in the United States, 1942–64.

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**TABLE 39.—Day's supply of gasoline and naphtha on hand in the United States at end of month [1]**

| | 1962 | 1963 | » 1964 | | 1962 | 1963 | » 1964 |
|---|---|---|---|---|---|---|---|
| January | 49.9 | 48.6 | 48.2 | July | 38.3 | 37.8 | 39.3 |
| February | 48.8 | 50.4 | 48.9 | August | 40.8 | 39.6 | 39.2 |
| March | 47.4 | 46.5 | 46.9 | September | 40.5 | 39.4 | 39.4 |
| April | 44.0 | 44.3 | 45.8 | October | 39.6 | 40.1 | 42.5 |
| May | 40.9 | 41.6 | 41.0 | November | 43.1 | 41.5 | 41.8 |
| June | 40.1 | 39.7 | 39.0 | December | 46.9 | 45.1 | 48.9 |

» Preliminary.
[1] Stocks divided by daily average total demand (domestic demand plus exports) for succeeding month.

**TABLE 40.—Average monthly prices of gasoline in the United States, by months and average for year**

(Cents per gallon)

| Monthly average | January | February | March | April | May | June | July |
|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | |
| At refineries in Oklahoma, regular, 91 octane | 12.10 | 11.64 | 12.00 | 12.48 | 12.75 | 13.06 | 12.94 |
| Of 55 cities on 1st of month: | | | | | | | |
| Dealer's net (excluding tax) | 15.45 | 15.26 | 14.64 | 14.91 | 15.55 | 14.35 | 15.75 |
| Service station (including State, local, and Federal taxes) | 30.67 | 30.43 | 29.56 | 30.03 | 30.67 | 29.46 | 31.14 |
| 1964: | | | | | | | |
| At refineries in Oklahoma, regular, 91 octane | 11.63 | 11.63 | 11.51 | 11.41 | 11.63 | 11.63 | 11.63 |
| Of cities on 1st of month: | | | | | | | |
| Dealer's net (excluding tax) | 15.20 | 14.66 | 14.91 | 14.75 | 14.35 | 14.44 | 15.50 |
| Service station (including State, local, and Federal taxes) | 30.74 | 29.97 | 30.29 | 30.24 | 29.86 | 29.93 | 31.09 |

| | August | September | October | November | December | Average for year |
|---|---|---|---|---|---|---|
| 1963: | | | | | | |
| At refineries in Oklahoma, regular, 91 octane | 12.19 | 11.80 | 12.23 | 11.00 | 11.57 | 12.15 |
| Of 55 cities on 1st of month: | | | | | | |
| Dealer's net (excluding tax) | 15.70 | 15.85 | 15.18 | 14.76 | 15.22 | 15.22 |
| Service station (including State, local, and Federal taxes) | 31.16 | 31.07 | 30.39 | 30.08 | 30.43 | 30.42 |
| 1964: | | | | | | |
| At refineries in Oklahoma, regular, 91 octane | 11.63 | 10.83 | 11.31 | 12.04 | 12.25 | 11.59 |
| Of 55 cities on 1st month: | | | | | | |
| Dealer's net (excluding tax) | 14.91 | 14.59 | 14.89 | 14.77 | 14.92 | 14.82 |
| Service station (including State, local, and Federal taxes) | 30.52 | 30.20 | 30.45 | 30.33 | 30.63 | 30.35 |

Source: Platt's Oil Price Handbook and Platt's Oilgram Price Service.

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## TABLE 41.—Transportation of petroleum products by pipeline, by months

(Thousand barrels)

| Item | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| Turned into lines: [1] | | | | | | | | | | | | | |
| Gasoline | 59,262 | 55,220 | 61,716 | 63,916 | 68,506 | 67,922 | 70,703 | 69,233 | 68,238 | 70,070 | 69,604 | 69,019 | 793,409 |
| Kerosine | 9,121 | 6,876 | 7,131 | 5,212 | 5,037 | 5,049 | 5,734 | 5,820 | 6,311 | 7,962 | 8,447 | 9,896 | 82,596 |
| Distillate fuel oil | 32,921 | 29,492 | 25,542 | 17,563 | 17,777 | 19,939 | 20,064 | 20,117 | 19,932 | 21,963 | 23,673 | 31,327 | 280,310 |
| Military jet fuel | 2,552 | 2,405 | 2,853 | 2,340 | 2,573 | 2,368 | 2,312 | 2,437 | 2,334 | 2,519 | 2,221 | 2,146 | 29,060 |
| Natural gas liquids | 13,107 | 10,254 | 7,971 | 7,272 | 7,789 | 7,527 | 8,930 | 10,169 | 9,483 | 10,172 | 10,524 | 14,024 | 117,222 |
| Delivered from lines: [1] | | | | | | | | | | | | | |
| Gasoline | 59,045 | 53,937 | 60,079 | 63,699 | 68,675 | 68,538 | 71,482 | 69,629 | 66,479 | 69,302 | 67,387 | 69,162 | 787,414 |
| Kerosine | 8,793 | 7,451 | 6,657 | 5,224 | 4,970 | 4,844 | 5,325 | 5,568 | 5,885 | 7,265 | 7,856 | 9,401 | 79,239 |
| Distillate fuel oil | 34,703 | 31,518 | 26,986 | 17,597 | 16,969 | 17,238 | 18,901 | 18,214 | 18,381 | 21,098 | 22,214 | 33,108 | 276,927 |
| Military jet fuel | 2,489 | 2,413 | 2,795 | 2,347 | 2,778 | 2,239 | 2,330 | 2,519 | 2,328 | 2,508 | 2,086 | 2,328 | 29,160 |
| Natural gas liquids | 13,001 | 10,382 | 8,890 | 7,246 | 7,563 | 7,357 | 9,013 | 9,857 | 8,519 | 9,677 | 10,618 | 13,754 | 115,877 |
| Shortage or overage: [2] | | | | | | | | | | | | | |
| Gasoline | (8) | (62) | (128) | 63 | 8 | (69) | 47 | 58 | 54 | (6) | 85 | (65) | (23) |
| Kerosine | 133 | 160 | 132 | 105 | 75 | 100 | 96 | 129 | 93 | 95 | 116 | 192 | 1,426 |
| Distillate fuel oil | (2) | (103) | 16 | (119) | 29 | 2 | 27 | (69) | (26) | (36) | (109) | 4 | (386) |
| Military jet fuel | (1) | 84 | 10 | 13 | 8 | ---------- | 11 | 12 | 9 | (19) | 31 | 4 | 162 |
| Natural gas liquids | 80 | 101 | 47 | 15 | 27 | 24 | 21 | (4) | 38 | 10 | 28 | 11 | 398 |
| Stocks in lines and working tanks at end of month: | | | | | | | | | | | | | |
| Gasoline | 25,635 | 26,980 | 28,745 | 28,899 | 28,722 | 28,175 | 27,349 | 26,895 | 28,600 | 29,374 | 31,506 | 31,428 | 31,428 |
| Kerosine | 2,791 | 2,056 | 2,398 | 2,281 | 2,273 | 2,378 | 2,691 | 2,814 | 3,147 | 3,749 | 4,224 | 4,527 | 4,527 |
| Distillate fuel oil | 13,846 | 11,923 | 10,463 | 10,548 | 11,327 | 14,026 | 15,162 | 17,134 | 18,711 | 19,612 | 21,180 | 19,395 | 19,395 |
| Military jet fuel | 842 | 750 | 798 | 784 | 571 | 700 | 571 | 577 | 574 | 604 | 708 | 522 | 522 |
| Natural gas liquids | 4,586 | 4,357 | 3,391 | 3,402 | 3,601 | 3,747 | 3,643 | 3,959 | 4,885 | 5,370 | 5,248 | 5,507 | 5,507 |

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1964: | | | | | | | | | | | | | |
| Turned into lines:[1] | | | | | | | | | | | | | |
| Gasoline | 68,700 | 67,130 | 70,690 | 73,377 | 79,962 | 80,279 | 82,573 | 82,584 | 76,920 | 81,817 | 78,246 | 82,620 | 924,898 |
| Kerosine | 10,842 | 8,130 | 6,804 | 6,561 | 6,460 | 6,876 | 7,087 | 7,069 | 8,388 | 9,183 | 10,913 | 12,304 | 100,617 |
| Distillate fuel oil | 35,395 | 24,532 | 21,299 | 20,773 | 21,644 | 21,035 | 24,780 | 23,160 | 25,197 | 26,247 | 31,669 | 43,000 | 318,731 |
| Military jet fuel | 2,479 | 2,300 | 2,959 | 2,898 | 2,647 | 2,695 | 2,812 | 2,047 | 2,376 | 2,907 | 2,686 | 2,623 | 31,427 |
| Natural gas liquids | 13,797 | 10,523 | 9,798 | 9,920 | 9,544 | 8,904 | 10,079 | 9,990 | 10,102 | 12,036 | 12,452 | 15,188 | 132,333 |
| Delivered from lines:[1] | | | | | | | | | | | | | |
| Gasoline | 68,056 | 63,865 | 68,232 | 73,516 | 78,642 | 83,404 | 82,633 | 83,672 | 77,890 | 81,757 | 78,874 | 84,087 | 924,637 |
| Kerosine | 10,822 | 8,991 | 6,844 | 6,278 | 6,248 | 6,215 | 6,758 | 7,034 | 7,597 | 8,613 | 10,242 | 12,530 | 98,172 |
| Distillate fuel oil | 36,754 | 27,121 | 23,481 | 20,611 | 19,462 | 19,284 | 22,607 | 20,617 | 23,934 | 25,629 | 30,663 | 44,542 | 314,705 |
| Military jet fuel | 2,307 | 2,351 | 2,786 | 2,764 | 2,765 | 2,657 | 2,666 | 2,265 | 2,363 | 2,990 | 2,561 | 2,673 | 31,148 |
| Natural gas liquids | 13,695 | 11,162 | 10,156 | 9,825 | 9,818 | 8,679 | 9,415 | 10,181 | 9,354 | 12,264 | 11,634 | 14,602 | 130,785 |
| Shortage or overage:[2] | | | | | | | | | | | | | |
| Gasoline | 5 | (319) | (51) | (47) | 52 | (46) | (52) | 7 | 16 | (91) | (91) | (271) | (888) |
| Kerosine | 191 | 174 | 149 | 143 | 144 | 142 | 151 | 162 | 143 | 139 | 156 | 284 | 1,978 |
| Distillate fuel oil | (109) | 95 | 32 | (66) | (23) | (66) | (37) | 123 | (33) | (48) | 16 | (23) | (139) |
| Military jet fuel | | 5 | 1 | 4 | 13 | 5 | 11 | 5 | 16 | 9 | 9 | 3 | 81 |
| Natural gas liquids | 77 | 19 | 13 | 48 | 18 | 32 | 64 | 43 | 33 | 137 | 132 | 194 | 810 |
| Stocks in lines and working tanks at end of month: | | | | | | | | | | | | | |
| Gasoline | 32,067 | 35,651 | 38,160 | 38,068 | 39,336 | 36,257 | 36,249 | 35,154 | 34,159 | 34,310 | 33,773 | 32,577 | 32,577 |
| Kerosine | 4,356 | 3,321 | 3,132 | 3,272 | 3,340 | 3,859 | 4,037 | 3,910 | 4,558 | 4,989 | 5,504 | 4,994 | 4,994 |
| Distillate fuel oil | 18,145 | 15,461 | 13,247 | 13,475 | 15,680 | 17,497 | 19,707 | 22,127 | 23,423 | 24,089 | 25,079 | 23,560 | 23,560 |
| Military jet fuel | 694 | 638 | 810 | 938 | 807 | 840 | 975 | 752 | 749 | 657 | 773 | 720 | 720 |
| Natural gas liquids | 5,532 | 4,874 | 4,503 | 4,550 | 4,258 | 4,451 | 5,051 | 4,817 | 5,532 | 5,167 | 5,853 | 6,245 | 6,245 |

[1] The quantities "Turned into lines" and "Delivered from lines" are on a net basis, eliminating intersystem transfers.
[2] Figures in parentheses represent overage.

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**TABLE 42.—Transportation of petroleum products by pipeline between PAD districts in the United States, by months**

(Thousand barrels)

| Item | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| From district 1 to district 2: | | | | | | | | | | | | | |
| Gasoline | 1,539 | 1,139 | 1,287 | 1,532 | 1,526 | 1,455 | 1,496 | 1,525 | 1,553 | 1,566 | 1,589 | 1,461 | 17,668 |
| Kerosine | 113 | 110 | 100 | 46 | 30 | 59 | 16 | 58 | 19 | 75 | 148 | 123 | 897 |
| Distillate fuel oil | 220 | 313 | 306 | 232 | 204 | 249 | 258 | 238 | 233 | 323 | 312 | 381 | 3,269 |
| From district 2 to district 1: | | | | | | | | | | | | | |
| Gasoline | 493 | 297 | 304 | 360 | 400 | 468 | 413 | 770 | 330 | 344 | 386 | 411 | 4,976 |
| Natural gas liquids | 209 | 76 | | | | | 115 | | 158 | 215 | 346 | 202 | 1,321 |
| From district 2 to district 3: | | | | | | | | | | | | | |
| Gasoline | 955 | 762 | 994 | 1,040 | 1,065 | 1,049 | 1,096 | 866 | 1,108 | 930 | 1,040 | 1,192 | 12,097 |
| Distillate fuel oil | 664 | 463 | 441 | 284 | 157 | 274 | 277 | 286 | 273 | 419 | 379 | 610 | 4,527 |
| Military jet fuel | 80 | 126 | 104 | 118 | 87 | 59 | 125 | 88 | 105 | 55 | 69 | 58 | 1,074 |
| From district 3 to district 1: | | | | | | | | | | | | | |
| Gasoline | 5,098 | 4,390 | 5,501 | 6,094 | 6,922 | 5,817 | 6,071 | 6,003 | 5,943 | 6,574 | 7,628 | 7,554 | 73,595 |
| Kerosine | 1,448 | 1,323 | 942 | 866 | 449 | 542 | 772 | 893 | 761 | 891 | 1,892 | 1,699 | 12,478 |
| Distillate fuel oil | 2,037 | 2,009 | 2,066 | 1,275 | 858 | 1,442 | 1,601 | 1,334 | 1,492 | 1,046 | 2,534 | 2,928 | 20,622 |
| Military jet fuel | 150 | 120 | 205 | 199 | 323 | 130 | 255 | 293 | 188 | 235 | 185 | 234 | 2,517 |
| Natural gas liquids | 520 | 561 | 264 | 135 | 148 | 196 | 359 | 367 | 235 | 275 | 352 | 765 | 4,177 |
| From district 3 to district 2: | | | | | | | | | | | | | |
| Gasoline | 3,405 | 2,900 | 3,705 | 4,337 | 4,495 | 3,827 | 3,714 | 4,086 | 3,945 | 4,228 | 3,802 | 3,335 | 45,779 |
| Kerosine | 437 | 608 | 165 | 167 | 218 | 29 | 149 | 162 | 165 | 132 | 194 | 296 | 2,722 |
| Distillate fuel oil | 1,217 | 1,527 | 751 | 626 | 720 | 1,090 | 975 | 909 | 1,059 | 596 | 758 | 1,016 | 11,244 |
| Military jet fuel | 15 | 50 | | | | | | | | | | | 65 |
| Natural gas liquids | 4,272 | 3,696 | 2,783 | 1,500 | 1,706 | 1,618 | 2,162 | 2,729 | 2,702 | 3,435 | 3,291 | 4,856 | 34,750 |
| From district 3 to district 4: | | | | | | | | | | | | | |
| Gasoline | 264 | 239 | 271 | 288 | 297 | 330 | 365 | 381 | 325 | 352 | 324 | 319 | 3,755 |
| Kerosine | 142 | 124 | 137 | 134 | 144 | 140 | 144 | 137 | 146 | 160 | 156 | 149 | 1,713 |
| Distillate fuel oil | 44 | 28 | 34 | 41 | 44 | 33 | 34 | 40 | 33 | 39 | 39 | 45 | 454 |
| Natural gas liquids | 156 | 61 | 57 | 31 | 23 | 22 | 24 | 45 | 22 | 23 | 53 | 131 | 648 |
| From district 3 to district 5: | | | | | | | | | | | | | |
| Gasoline | 664 | 575 | 598 | 731 | 602 | 649 | 587 | 649 | 629 | 715 | 739 | 562 | 7,700 |
| Kerosine | 33 | 33 | 35 | 25 | 23 | 16 | 14 | 36 | 20 | 22 | 30 | 32 | 319 |
| Distillate fuel oil | 115 | 158 | 163 | 153 | 85 | 113 | 119 | 179 | 143 | 156 | 156 | 134 | 1,674 |
| Military jet fuel | 202 | 176 | 270 | 140 | 139 | 60 | 60 | 152 | 140 | 129 | 93 | 228 | 1,789 |
| From district 4 to district 2: | | | | | | | | | | | | | |
| Gasoline | 188 | 212 | 298 | 277 | 262 | 312 | 286 | 335 | 253 | 191 | 218 | 266 | 3,098 |
| Kerosine | 4 | 4 | 4 | 2 | 4 | 3 | 3 | 3 | 2 | 4 | 3 | 2 | 38 |
| Distillate fuel oil | 147 | 106 | 145 | 103 | 112 | 94 | 118 | 88 | 116 | 157 | 174 | 130 | 1,490 |
| From district 4 to district 5: | | | | | | | | | | | | | |
| Gasoline | 513 | 470 | 660 | 537 | 618 | 643 | 547 | 666 | 549 | 573 | 529 | 528 | 6,833 |
| Distillate fuel oil | 374 | 390 | 407 | 281 | 202 | 242 | 322 | 203 | 296 | 302 | 274 | 475 | 3,768 |
| Military jet fuel | 268 | 242 | 343 | 224 | 359 | 197 | 199 | 68 | 117 | 391 | 327 | 332 | 3,067 |

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1964: | | | | | | | | | | | | | |
| From district 1 to district 2: | | | | | | | | | | | | | |
| Gasoline | 1,441 | 1,348 | 1,856 | 1,816 | 2,130 | 1,935 | 2,208 | 2,086 | 2,170 | 2,050 | 1,962 | 2,033 | 23,115 |
| Kerosine | 140 | 150 | 96 | 70 | 39 | 40 | 45 | 51 | 47 | 94 | 126 | 165 | 1,064 |
| Distillate fuel oil | 307 | 344 | 234 | 356 | 236 | 333 | 297 | 345 | 286 | 380 | 398 | 462 | 3,978 |
| From district 2 to district 1: | | | | | | | | | | | | | |
| Gasoline | 339 | 299 | 221 | 258 | 156 | 257 | 370 | 204 | 254 | 296 | 254 | 284 | 3,192 |
| Natural gas liquids | 105 | 118 | 57 | 123 | 116 | 82 | 105 | 113 | 376 | 472 | 468 | 375 | 2,510 |
| From district 2 to district 3: | | | | | | | | | | | | | |
| Gasoline | 891 | 924 | 1,165 | 1,125 | 1,368 | 1,315 | 1,123 | 1,104 | 1,280 | 1,299 | 1,232 | 1,036 | 13,842 |
| Distillate fuel oil | 808 | 737 | 301 | 233 | 175 | 300 | 172 | 313 | 282 | 347 | 307 | 405 | 4,380 |
| Military jet fuel | 45 | 66 | 70 | 119 | 69 | 99 | 30 | 30 | 96 | 70 | 129 | 89 | 912 |
| From district 3 to district 1: | | | | | | | | | | | | | |
| Gasoline | 5,452 | 6,625 | 6,678 | 8,574 | 10,461 | 8,175 | 10,622 | 8,117 | 10,250 | 8,304 | 10,626 | 12,521 | 106,405 |
| Kerosine | 2,229 | 1,203 | 836 | 909 | 696 | 1,451 | 1,066 | 1,569 | 1,040 | 2,392 | 2,604 | 3,027 | 19,012 |
| Distillate fuel oil | 3,582 | 2,378 | 2,346 | 1,371 | 1,748 | 2,791 | 1,981 | 4,090 | 2,862 | 5,183 | 4,929 | 7,975 | 41,226 |
| Military jet fuel | 101 | 213 | 291 | 180 | 245 | 276 | 221 | 225 | 152 | 292 | 247 | 163 | 2,606 |
| Natural gas liquids | 822 | 559 | 345 | 244 | 181 | 269 | 466 | 573 | 363 | 403 | 443 | 699 | 5,457 |
| From district 3 to district 2: | | | | | | | | | | | | | |
| Gasoline | 2,545 | 3,162 | 2,822 | 3,438 | 3,904 | 4,046 | 3,752 | 3,436 | 3,220 | 2,801 | 3,381 | 2,594 | 39,101 |
| Kerosine | 589 | 320 | 166 | 93 | 187 | 17 | 91 | 38 | 84 | 45 | 219 | 143 | 1,992 |
| Distillate fuel oil | 1,951 | 1,218 | 479 | 623 | 814 | 233 | 946 | 665 | 684 | 663 | 813 | 982 | 10,071 |
| Military jet fuel | | | 42 | | | | | | | | | | 42 |
| Natural gas liquids | 5,333 | 2,897 | 2,179 | 2,113 | 2,114 | 1,968 | 1,965 | 2,626 | 2,961 | 4,052 | 4,235 | 4,767 | 37,210 |
| From district 3 to district 4: | | | | | | | | | | | | | |
| Gasoline | 669 | 300 | 328 | 340 | 345 | 391 | 391 | 395 | 340 | 337 | 288 | 311 | 4,435 |
| Kerosine | 168 | 144 | 145 | 156 | 167 | 161 | 174 | 174 | 185 | 208 | 178 | 197 | 2,057 |
| Distillate fuel oil | 43 | 40 | 44 | 48 | 44 | 50 | 41 | 43 | 39 | 40 | 33 | 33 | 498 |
| Natural gas liquids | 174 | 404 | 103 | 65 | 41 | 35 | 56 | 67 | 170 | 109 | 84 | 138 | 1,446 |
| From district 3 to district 5: | | | | | | | | | | | | | |
| Gasoline | 688 | 687 | 632 | 744 | 843 | 732 | 643 | 763 | 709 | 718 | 646 | 659 | 8,464 |
| Kerosine | 34 | 33 | 49 | 16 | 29 | 40 | 40 | 19 | 24 | 40 | 33 | 78 | 435 |
| Distillate fuel oil | 167 | 162 | 172 | 147 | 116 | 119 | 174 | 95 | 148 | 139 | 165 | 129 | 1,733 |
| Military jet fuel | 82 | 120 | 203 | 168 | 210 | 208 | 215 | 212 | 103 | 174 | 174 | 223 | 2,092 |
| From district 4 to district 2: | | | | | | | | | | | | | |
| Gasoline | 191 | 227 | 291 | 247 | 443 | 350 | 384 | 387 | 339 | 269 | 274 | 235 | 3,637 |
| Kerosine | 3 | | 7 | 5 | 2 | | | | 2 | 2 | 4 | 5 | 30 |
| Distillate fuel oil | 165 | 111 | 146 | 146 | 147 | 128 | 127 | 134 | 88 | 104 | 114 | 182 | 1,652 |
| From district 4 to district 5: | | | | | | | | | | | | | |
| Gasoline | 487 | 474 | 579 | 573 | 618 | 693 | 506 | 803 | 627 | 764 | 616 | 661 | 7,401 |
| Distillate fuel oil | 423 | 331 | 332 | 358 | 247 | 253 | 193 | 191 | 322 | 521 | 478 | 531 | 4,180 |
| Military jet fuel | 386 | 397 | 434 | 393 | 501 | 465 | 147 | 338 | 346 | 224 | 299 | 407 | 4,337 |

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## KEROSINE

The total demand for kerosine in 1964 was 178,580,000 barrels and this included exports of 171,000 barrels; shipments for commercial jet aircraft fuel consisted of 85,672,000 barrels; and other domestic uses amounted to 92,737,000 barrels. The increase in requirements for kerosine destined for jet-fuel usage accounts for most of the growth in domestic kerosine demand. In 1963, the jet-fuel usage accounted for 44 percent of the demand, while in 1964 it represented 48 percent.

The use of kerosine, imported in bond (duty-free), as jet fuel for aircraft engaged in overseas flights increased from 24,000 barrels per day in 1963 to about 30,000 barrels daily in 1964. Pipeline deliveries of kerosine were about 19 million barrels more in 1964 than in 1963, and tidewater shipments from the gulf to the east coast decreased by nearly 9 million barrels.

Tanker rates for kerosine from the gulf coast to U.S. destinations north of Cape Hatteras in 1964 averaged 39.9 cents per barrel, compared with 42.4 cents per barrel in 1963.

The average posted price of kerosine at Oklahoma refineries in 1964 was 10.5 cents per gallon. The average posted price on barges in New York Harbor for 1964 was 10.2 cents per gallon.

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**TABLE 43.—Salient statistics of kerosine in the United States, by months and refinery districts**

(Thousand barrels)

| Month and district | 1963 | | | | | | | p 1964 | | | | | | | Shipments for commercial jet aircraft [1] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production from crude | Yield (percent) | Production from natural gas liquids | Imports | Exports | Stocks (end of period) | Domestic demand | Production from crude | Yield (percent) | Production from natural gas liquids | Imports | Exports | Stocks (end of period) | Domestic demand | 1963 | 1964 |
| Month: | | | | | | | | | | | | | | | | |
| January | 15,667 | 5.6 | 171 | 625 | 103 | 26,103 | 22,655 | 17,080 | 6.2 | 212 | 675 | 7 | 30,863 | 21,199 | 6,227 | 6,456 |
| February | 14,943 | 5.9 | 126 | 393 | 173 | 22,400 | 18,992 | 14,567 | 5.6 | 116 | 666 | 26 | 28,528 | 17,658 | 5,424 | 6,121 |
| March | 14,428 | 5.4 | 71 | 566 | 50 | 23,216 | 14,199 | 14,211 | 5.3 | 99 | 782 | 11 | 28,454 | 15,155 | 6,161 | 6,898 |
| April | 13,461 | 5.4 | 89 | 722 | 22 | 27,344 | 10,122 | 12,396 | 5.3 | 74 | 779 | 12 | 29,063 | 12,628 | 6,177 | 6,777 |
| May | 11,840 | 4.5 | 46 | 588 | 187 | 29,578 | 10,053 | 11,500 | 4.3 | 151 | 896 | 21 | 30,535 | 11,054 | 6,282 | 6,697 |
| June | 11,610 | 4.4 | 68 | 861 | 7 | 32,285 | 9,825 | 11,419 | 4.2 | 147 | 1,033 | 5 | 32,845 | 10,284 | 6,177 | 7,060 |
| July | 12,834 | 4.6 | 73 | 979 | 21 | 35,246 | 10,904 | 12,548 | 4.4 | 107 | 1,230 | 22 | 34,428 | 12,280 | 6,655 | 7,707 |
| August | 12,445 | 4.4 | 65 | 848 | 32 | 36,214 | 12,358 | 13,288 | 4.4 | 66 | 1,091 | 10 | 36,042 | 12,821 | 6,561 | 7,619 |
| September | 12,163 | 4.6 | 43 | 896 | 12 | 35,978 | 13,326 | 13,825 | 5.1 | 98 | 997 | 11 | 37,280 | 13,671 | 6,212 | 7,276 |
| October | 14,709 | 5.5 | 148 | 776 | 16 | 39,118 | 12,477 | 15,211 | 5.5 | 78 | 1,121 | 10 | 37,874 | 15,806 | 6,822 | 7,954 |
| November | 14,659 | 5.6 | 100 | 682 | 26 | 39,131 | 15,402 | 14,939 | 5.6 | 107 | 838 | 19 | 38,620 | 15,119 | 6,205 | 7,649 |
| December | 16,046 | 5.8 | 141 | 706 | 23 | 34,102 | 21,899 | 17,037 | 6.0 | 238 | 1,021 | 17 | 36,165 | 20,734 | 6,333 | 7,458 |
| Total | 164,805 | 5.1 | 1,141 | 8,642 | 672 | 34,102 | 172,212 | 168,021 | 5.2 | 1,493 | 11,129 | 171 | 36,165 | 178,409 | 75,236 | 85,672 |
| District: | | | | | | | | | | | | | | | | |
| East Coast | 15,093 | 3.3 | ------- | 5,787 | 75 | 12,262 | NA | 14,046 | 3.1 | ------- | 7,785 | 74 | 14,605 | NA | 54,533 | 61,077 |
| Appalachian No. 1 | 1,337 | 3.5 | ------- | | | 674 | | 1,404 | 3.5 | ------- | | | 861 | | | |
| Appalachian No. 2 | 1,976 | 5.4 | ------- | | | 468 | | 1,924 | 5.1 | ------- | | | 418 | | | |
| Indiana, Illinois, Kentucky, etc | 33,012 | 5.8 | ------- | | 11 | 6,210 | | 31,409 | 5.4 | ------- | | 3 | 6,498 | | | |
| Minnesota, Wisconsin, etc | 1,997 | 4.1 | ------- | ------- | | 1,685 | | 1,823 | 3.4 | ------- | ------- | | 1,330 | | | |
| Oklahoma, Kansas, etc | 5,269 | 1.9 | ------- | | | 1,360 | | 6,070 | 2.2 | ------- | | | 1,202 | | | |
| Texas Inland | 4,509 | 4.0 | 310 | | | 597 | | 4,758 | 4.1 | 320 | | | 661 | | | |
| Texas Gulf Coast | 53,362 | 7.2 | 90 | | | 4,304 | | 53,528 | 7.2 | 92 | | | 4,312 | | | |
| Louisiana Gulf Coast | 25,942 | 9.0 | 419 | 20 | 543 | 1,695 | | 27,576 | 8.8 | 358 | | 68 | 2,404 | | | |
| Arkansas, Louisiana Inland, etc | 1,729 | 3.9 | 303 | | | 1,788 | | 2,003 | 4.4 | 698 | | | 973 | | | |
| New Mexico | 167 | 1.7 | 19 | | | 70 | | 152 | 1.4 | 25 | | | 54 | | | |
| Rocky Mountain | 2,304 | 2.1 | ------- | ------- | ------- | 433 | | 2,890 | 2.5 | ------- | ------- | ------- | 379 | | | |
| West Coast | 18,108 | 3.9 | ------- | 2,835 | 43 | 2,556 | NA | 20,438 | 4.3 | ------- | 3,344 | 26 | 2,468 | NA | 20,703 | 24,595 |
| Total | 164,805 | 5.1 | 1,141 | 8,642 | 672 | 34,102 | 172,212 | 168,021 | 5.2 | 1,493 | 11,129 | 171 | 36,165 | 178,409 | 75,236 | 85,672 |

p Preliminary. NA Not available.
[1] Included in total demand for kerosine.

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**TABLE 44.—Consumption of kerosine in the United States, by PAD districts, States, and uses [1]**

(Thousand barrels)

| District and State | Range oil | | Tractor fuel | | All other uses | | Total | |
|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| District 1: | | | | | | | | |
| Connecticut | 1,282 | 1,100 | | | 88 | 93 | 1,370 | 1,193 |
| Delaware | 883 | 584 | | | 25 | 104 | 908 | 688 |
| District of Columbia | 132 | 69 | | | 3 | 13 | 135 | 82 |
| Florida | 4,099 | 3,274 | 76 | 69 | 431 | 907 | 4,606 | 4,250 |
| Georgia | 884 | 733 | 81 | 83 | 333 | 373 | 1,298 | 1,189 |
| Maine | 2,532 | 1,866 | 3 | 3 | 94 | 195 | 2,629 | 2,064 |
| Maryland | 2,422 | 2,257 | 1 | 7 | 64 | 72 | 2,487 | 2,336 |
| Massachusetts | 4,422 | 3,500 | | | 224 | 386 | 4,646 | 3,886 |
| New Hampshire | 883 | 676 | | | 14 | 17 | 897 | 693 |
| New Jersey | 1,801 | 1,507 | 6 | 7 | 264 | 296 | 2,131 | 1,810 |
| New York | 4,958 | 4,513 | 19 | 16 | 434 | 605 | 5,411 | 5,134 |
| North Carolina | 11,617 | 10,356 | 64 | 58 | 1,484 | 1,309 | 13,165 | 11,723 |
| Pennsylvania | 3,151 | 2,934 | 26 | 17 | 357 | 547 | 3,534 | 3,498 |
| Rhode Island | 719 | 422 | | | 44 | 48 | 763 | 470 |
| South Carolina | 3,666 | 3,012 | 4 | 10 | 532 | 382 | 4,202 | 3,404 |
| Vermont | 709 | 540 | 13 | 7 | | | 722 | 547 |
| Virginia | 5,380 | 4,667 | 36 | 35 | 211 | 352 | 5,627 | 5,054 |
| West Virginia | 216 | 142 | | | 13 | 37 | 229 | 179 |
| Total | 49,816 | 42,152 | 329 | 312 | 4,615 | 5,736 | 54,760 | 48,200 |
| District 2: | | | | | | | | |
| Illinois | 4,300 | 3,989 | 26 | 20 | 1,195 | 1,033 | 5,521 | 5,042 |
| Indiana | 3,040 | 2,898 | 7 | 5 | 786 | 696 | 3,833 | 3,599 |
| Iowa | 2,083 | 1,903 | 19 | 12 | 135 | 140 | 2,237 | 2,055 |
| Kansas | 266 | 225 | | 13 | 110 | 132 | 376 | 370 |
| Kentucky | 1,020 | 1,012 | | | 218 | 162 | 1,238 | 1,174 |
| Michigan | 4,466 | 4,470 | 36 | 40 | 1,458 | 1,278 | 5,960 | 5,788 |
| Minnesota | 2,126 | 2,093 | 14 | 15 | 239 | 248 | 2,379 | 2,356 |
| Missouri | 958 | 888 | 22 | 25 | 104 | 102 | 1,084 | 1,015 |
| Nebraska | 315 | 322 | 15 | 15 | 113 | 139 | 443 | 476 |
| North Dakota | 902 | 873 | | | 9 | 13 | 911 | 886 |
| Ohio | 2,665 | 2,123 | 8 | 15 | 663 | 924 | 3,336 | 3,062 |
| Oklahoma | 309 | 212 | 11 | 5 | 180 | 99 | 500 | 316 |
| South Dakota | 883 | 881 | 2 | 15 | 19 | 20 | 904 | 916 |
| Tennessee | 1,402 | 1,040 | 5 | 3 | 852 | 1,235 | 2,259 | 2,278 |
| Wisconsin | 2,398 | 2,020 | 5 | 3 | | 86 | 2,403 | 2,109 |
| Total | 27,133 | 24,949 | 170 | 186 | 6,081 | 6,307 | 33,384 | 31,442 |
| District 3: | | | | | | | | |
| Alabama | 316 | 386 | 25 | 104 | 119 | 230 | 460 | 720 |
| Arkansas | 121 | 179 | 19 | 80 | 61 | 124 | 201 | 383 |
| Louisiana | 271 | 328 | 16 | 109 | 210 | 283 | 497 | 720 |
| Mississippi | 88 | 80 | 13 | 13 | 72 | 206 | 173 | 299 |
| New Mexico | 110 | 164 | 1 | 9 | 54 | 184 | 165 | 357 |
| Texas | 584 | 793 | 131 | 149 | 1,330 | 2,595 | 2,045 | 3,537 |
| Total | 1,490 | 1,930 | 205 | 464 | 1,846 | 3,622 | 3,541 | 6,016 |
| District 4: | | | | | | | | |
| Colorado | 242 | 378 | 2 | 7 | 35 | 140 | 279 | 525 |
| Idaho | 260 | 363 | | 4 | 7 | 18 | 267 | 385 |
| Montana | 345 | 629 | | | 3 | 22 | 348 | 651 |
| Utah | 337 | 493 | | 8 | 35 | 40 | 372 | 541 |
| Wyoming | 89 | 126 | | 4 | 11 | 10 | 100 | 140 |
| Total | 1,273 | 1,989 | 2 | 23 | 91 | 230 | 1,366 | 2,242 |
| District 5: | | | | | | | | |
| Alaska | 6 | 8 | | | 22 | | 28 | 8 |
| Arizona | 10 | 10 | | | 4 | 16 | 14 | 26 |
| California | 118 | 123 | | | 741 | 828 | 859 | 951 |
| Hawaii | 34 | 44 | | | 14 | 4 | 48 | 48 |
| Nevada | | 1 | | | 3 | 6 | 3 | 7 |
| Oregon | 5 | 9 | | | 15 | 5 | 20 | 14 |
| Washington | 4 | 9 | | | 34 | 13 | 38 | 22 |
| Total | 177 | 204 | | | 833 | 872 | 1,010 | 1,076 |
| Total United States | 79,889 | 71,224 | 706 | 985 | 13,466 | 16,767 | 94,061 | 88,976 |

[1] Excludes kerosene type jet fuel.

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TABLE 46.—Monthly average refinery and terminal prices of kerosine including No. 1 fuel oil in the United States, 1963–64

(Cents per gallon)

| Year and area | January | February | March | April | May | June | July | August | September | October | November | December | Average for year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| No. 1 range oil at Chicago district | 11.92 | 11.93 | 11.90 | 11.71 | 11.43 | 11.37 | 11.18 | 11.18 | 11.18 | 11.41 | 11.29 | 11.44 | 11.49 |
| No. 1 fuel oil at Oklahoma | 10.69 | 11.13 | 11.08 | 11.00 | 10.94 | 10.88 | 10.88 | 10.88 | 10.88 | 10.88 | 10.88 | 10.88 | 10.91 |
| Kerosine (and/or No. 1 fuel oil) at New York Harbor (cargo) | 11.64 | 11.50 | 11.44 | 11.28 | 10.52 | 10.50 | 10.50 | 10.40 | 10.25 | 10.29 | 10.40 | 10.84 | 10.80 |
| Kerosine (and/or No. 1 fuel oil) at Tampa | 12.05 | 12.10 | 12.10 | 12.10 | 11.68 | 11.60 | 11.60 | 11.60 | 11.60 | 11.60 | 11.60 | 11.60 | 11.77 |
| 1964: | | | | | | | | | | | | | |
| No. 1 range oil at Chicago district | 11.73 | 11.45 | 11.36 | 11.00 | 9.14 | 8.89 | 8.88 | 8.88 | 8.90 | 9.23 | 9.50 | 9.81 | 9.90 |
| No. 1 fuel oil at Oklahoma | 10.88 | 10.88 | 10.69 | 10.38 | 10.38 | 10.38 | 10.38 | 10.38 | 10.38 | 10.38 | 10.38 | 10.50 | 10.49 |
| Kerosine (and/or No. 1 fuel oil) at New York Harbor (cargo) | 11.14 | 10.99 | 10.75 | 10.00 | 9.85 | 9.80 | 9.80 | 9.80 | 9.80 | 10.00 | 10.19 | 10.55 | 10.22 |
| Kerosine (and/or No. 1 fuel oil) at Tampa | 11.60 | 11.60 | 11.60 | 11.60 | 11.50 | 11.35 | 11.35 | 11.35 | 11.35 | 11.35 | 11.35 | 11.35 | 11.45 |

Source: Platt's Oil Price Handbook.

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## TABLE 46.—Salient statistics of distillate fuel oil in the United States, by months and refinery districts

(Thousand barrels unless otherwise stated)

| Month and district | 1963 | | | | | | | | p 1964 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production from crude | Yield (percent) | Production from natural gas liquids | Crude used directly as distillate [1] | Imports | Exports | Stocks (end of period) | Domestic demand | Production from crude | Yield (percent) | Production from natural gas liquids | Crude used directly as distillate [1] | Imports | Exports | Stocks (end of period) | Domestic demand |
| Month: | | | | | | | | | | | | | | | | |
| January | 70,904 | 25.8 | 45 | 77 | 1,076 | 1,104 | 111,674 | 103,285 | 67,443 | 24.3 | 40 | 68 | 1,581 | 1,222 | 128,534 | 96,053 |
| February | 66,598 | 26.3 | 42 | 72 | 722 | 3,002 | 87,812 | 88,294 | 62,812 | 24.3 | 32 | 60 | 1,069 | 442 | 110,527 | 81,538 |
| March | 68,407 | 25.4 | 33 | 94 | 710 | 1,125 | 83,913 | 72,018 | 61,681 | 22.8 | 38 | 87 | 875 | 616 | 99,195 | 73,397 |
| April | 57,234 | 23.0 | 36 | 66 | 606 | 1,238 | 91,718 | 48,899 | 57,525 | 22.8 | 33 | 61 | 787 | 264 | 97,758 | 59,579 |
| May | 60,155 | 23.0 | 38 | 61 | 606 | 1,175 | 103,160 | 48,243 | 60,775 | 22.6 | 31 | 53 | 723 | 311 | 112,185 | 46,844 |
| June | 60,073 | 22.6 | 34 | 63 | 711 | 997 | 123,364 | 39,680 | 61,092 | 22.5 | 33 | 62 | 1,035 | 310 | 130,272 | 43,825 |
| July | 62,319 | 22.5 | 44 | 62 | 714 | 995 | 145,239 | 40,269 | 64,184 | 22.3 | 37 | 63 | 627 | 364 | 153,462 | 41,177 |
| August | 63,309 | 22.8 | 39 | 64 | 631 | 1,129 | 165,188 | 42,965 | 61,986 | 21.8 | 33 | 62 | 856 | 196 | 175,033 | 41,350 |
| September | 63,117 | 23.7 | 34 | 61 | 678 | 1,371 | 177,231 | 50,476 | 59,347 | 22.0 | 29 | 58 | 912 | 576 | 186,726 | 48,077 |
| October | 63,824 | 23.8 | 45 | 61 | 867 | 985 | 191,394 | 49,649 | 59,010 | 21.4 | 28 | 58 | 840 | 508 | 189,364 | 56,790 |
| November | 62,858 | 23.9 | 44 | 57 | 956 | 1,431 | 192,561 | 61,317 | 58,662 | 22.1 | 28 | 62 | 574 | 253 | 182,579 | 65,858 |
| December | 65,799 | 23.8 | 36 | 69 | 833 | 462 | 156,677 | 102,159 | 66,172 | 23.4 | 31 | 61 | 1,893 | 372 | 155,846 | 94,518 |
| Total | 764,597 | 23.9 | 470 | 807 | 9,110 | 15,014 | 156,677 | 747,254 | 740,689 | 22.6 | 393 | 755 | 11,772 | 5,434 | 155,846 | 749,006 |
| District: | | | | | | | | | | | | | | | | |
| East Coast | 129,378 | 28.3 | ------- | ------- | 7,787 | 990 | 58,026 | NA | 119,640 | 26.6 | ------- | ------- | 10,546 | 144 | 64,470 | NA |
| Appalachian No. 1 | 9,108 | 23.6 | ------- | ------- | | | 3,775 | | 9,429 | 23.7 | ------- | ------- | | | 3,823 | |
| Appalachian No. 2 | 7,310 | 19.8 | ------- | ------- | | | 1,803 | | 7,001 | 18.5 | ------- | ------- | | | 1,730 | |
| Indiana, Illinois, Kentucky, etc. | 123,297 | 21.7 | ------- | 198 | 63 | 53 | 26,774 | | 115,956 | 20.2 | ------- | 176 | 64 | 217 | 22,792 | |
| Minnesota, Wisconsin, etc. | 11,220 | 22.8 | ------- | 182 | | | 7,762 | | 12,873 | 23.9 | ------- | 177 | | | 7,368 | |
| Oklahoma, Kansas, etc. | 68,465 | 25.3 | ------- | 122 | | | 14,166 | | 65,070 | 23.9 | ------- | 109 | | | 12,232 | |
| Texas Inland | 19,448 | 17.0 | 232 | 90 | | | 2,143 | | 19,319 | 16.5 | 172 | 87 | | | 2,513 | |
| Texas Gulf Coast | 208,686 | 28.1 | 69 | 50 | | | 16,727 | | 200,801 | 26.7 | 42 | 50 | | | 15,578 | |
| Louisiana Gulf Coast | 74,098 | 25.8 | 2 | 31 | 1,250 | 4,320 | 5,409 | | 74,555 | 23.6 | ------- | 26 | 1,119 | 155 | 6,396 | |
| Arkansas, Louisiana Inland, etc. | 9,966 | 22.2 | 167 | ------- | | | 3,448 | | 10,386 | 22.5 | 179 | ------- | | | 2,619 | |
| New Mexico | 1,597 | 16.0 | ------- | 57 | | | 180 | | 1,712 | 15.8 | ------- | 53 | | | 179 | |
| Rocky Mountain | 24,545 | 21.8 | ------- | 77 | 1 | 20 | 2,587 | | 25,833 | 22.2 | ------- | 77 | ------- | 30 | 2,455 | |
| West Coast | 77,479 | 16.5 | ------- | ------- | 9 | 9,631 | 13,877 | | 78,114 | 16.2 | ------- | ------- | 43 | 4,888 | 13,691 | |
| Total | 764,597 | 23.9 | 470 | 807 | 9,110 | 15,014 | 156,677 | 747,254 | 740,689 | 22.6 | 393 | 755 | 11,772 | 5,434 | 155,846 | 749,006 |

p Preliminary. NA Not available.
[1] Figures represent crude oil used as fuel on pipelines, which is considered part of the demand for distillate.

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## DISTILLATE FUEL OIL

The total demand for distillate fuel oil in 1964 was 754,440,000 barrels. This included a domestic demand of 749,006,000 barrels and exports of 5,434,000 barrels. Domestic demand did not change significantly over that of 1963, but exports in 1964 were only a little more than a third the amount exported in 1963.

Refineries decreased the production of distillate fuel oil in 1964 by 23,908,000 barrels. The production at natural gas liquids plants declined, as did direct transfers from crude oil; imports increased appreciably. The total new supply for the year (753,609,000 barrels) was 21,375,000 less than in 1963. The new supply satisfied nearly all the demand in 1964, leaving stocks at a level only slightly lower at the end of 1964 than they were at the end of 1963.

The average wholesale price for distillate fuel oils in 1964 was 8.65 cents per gallon compared with 9.18 cents in 1963.

The tanker rate for No. 2 distillate fuel oil from the gulf coast to New York Harbor averaged 42.0 cents per barrel in 1964, compared with 44.5 cents in 1963.

Pipeline deliveries of distillate fuel oil increased 13.6 percent in 1964 to 314,705,000 barrels. Tidewater shipments from the gulf coast to the east coast decreased about 14 percent, and tidewater shipments from the west to the east coast in 1964 were less than half the 1963 shipments.

**TABLE 47.—Consumption of distillate fuel oil [1] in the United States, by uses**

(Thousand barrels)

| Use | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Heating oils | 422,855 | 434,805 | 450,031 | 449,159 | 436,204 |
| Range oil (No. 1 fuel oil) | 15,155 | 15,487 | 16,799 | 16,156 | 15,656 |
| Industrial (excluding oil company) | 34,271 | 31,226 | 34,951 | 36,647 | 36,007 |
| Oil company (excluding heating oil) | 8,347 | 8,743 | 9,055 | 10,253 | 10,576 |
| Gas and electric public utility powerplants | 4,742 | 4,151 | 4,100 | 4,149 | 3,849 |
| Railroads | 86,490 | 85,180 | 86,803 | 88,117 | 88,198 |
| Bunkering of vessels (including company tankers but excluding military) | 18,730 | 14,566 | 15,836 | 15,148 | 16,001 |
| Military (U.S. Army, Navy, Air Force, and Marine Corps) | 10,793 | 11,484 | 13,041 | 13,436 | 13,609 |
| Miscellaneous uses: | | | | | |
| Diesel fuel | 74,562 | 77,825 | 89,729 | 106,341 | 117,534 |
| Other light distillates | 7,380 | 7,407 | 8,750 | 8,718 | 9,917 |
| Total United States | 683,325 | 690,874 | 729,095 | 748,124 | 747,551 |

[1] Includes diesel fuel.

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**TABLE 48.—Consumption of distillate fuel oil[1] in the United States, by PAD districts and States**

(Thousand barrels)

| District and State | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| District 1: | | | | | |
| Connecticut | 23,230 | 23,199 | 23,099 | 22,906 | 20,378 |
| Delaware | 2,723 | 2,537 | 3,097 | 3,474 | 3,257 |
| District of Columbia | 2,914 | 2,726 | 2,878 | 2,872 | 2,957 |
| Florida | 8,971 | 9,369 | 10,611 | 10,902 | 11,076 |
| Georgia | 5,117 | 5,269 | 6,218 | 6,969 | 6,977 |
| Maine | 7,456 | 8,307 | 8,645 | 9,487 | 8,792 |
| Maryland | 13,101 | 14,257 | 15,146 | 16,014 | 16,863 |
| Massachusetts | 51,022 | 52,266 | 53,448 | 51,664 | 49,966 |
| New Hampshire | 4,484 | 5,486 | 5,834 | 6,327 | 5,742 |
| New Jersey | 45,542 | 46,992 | 48,622 | 51,466 | 51,655 |
| New York | 81,677 | 86,029 | 94,501 | 95,856 | 94,610 |
| North Carolina | 13,353 | 13,366 | 15,617 | 16,000 | 16,249 |
| Pennsylvania | 45,668 | 45,982 | 49,315 | 51,702 | 50,699 |
| Rhode Island | 8,093 | 7,547 | 7,411 | 7,391 | 6,272 |
| South Carolina | 5,203 | 5,116 | 5,776 | 6,169 | 5,228 |
| Vermont | 2,939 | 3,299 | 3,602 | 3,787 | 3,603 |
| Virginia | 14,184 | 14,631 | 15,843 | 16,945 | 16,542 |
| West Virginia | 2,462 | 2,525 | 2,490 | 2,622 | 2,320 |
| Total | 338,139 | 348,903 | 372,153 | 382,553 | 373,186 |
| District 2: | | | | | |
| Illinois | 42,490 | 42,255 | 41,361 | 41,421 | 41,580 |
| Indiana | 25,596 | 25,452 | 25,743 | 25,934 | 25,813 |
| Iowa | 11,141 | 10,043 | 11,022 | 11,106 | 10,968 |
| Kansas | 4,751 | 5,187 | 5,242 | 5,612 | 5,487 |
| Kentucky | 4,833 | 4,426 | 5,822 | 5,532 | 5,697 |
| Michigan | 30,464 | 30,547 | 31,131 | 30,471 | 29,576 |
| Minnesota | 16,241 | 15,967 | 16,776 | 16,629 | 16,739 |
| Missouri | 12,830 | 12,858 | 13,412 | 13,939 | 13,884 |
| Nebraska | 4,183 | 4,481 | 4,099 | 4,387 | 4,689 |
| North Dakota | 3,775 | 3,693 | 4,472 | 4,584 | 4,529 |
| Ohio | 23,836 | 23,433 | 24,250 | 26,348 | 27,121 |
| Oklahoma | 2,631 | 3,152 | 3,243 | 3,729 | 3,325 |
| South Dakota | 2,964 | 3,085 | 3,212 | 3,370 | 3,823 |
| Tennessee | 5,268 | 5,552 | 6,167 | 6,706 | 6,784 |
| Wisconsin | 21,711 | 22,153 | 23,399 | 23,461 | 23,328 |
| Total | 212,714 | 212,284 | 219,351 | 223,229 | 223,343 |
| District 3: | | | | | |
| Alabama | 5,370 | 4,310 | 4,938 | 5,148 | 5,887 |
| Arkansas | 2,052 | 3,078 | 2,451 | 2,579 | 3,358 |
| Louisiana | 10,694 | 9,038 | 9,622 | 9,762 | 9,688 |
| Mississippi | 2,364 | 1,954 | 2,715 | 2,885 | 3,322 |
| New Mexico | 3,065 | 2,841 | 3,512 | 3,642 | 3,946 |
| Texas | 24,315 | 21,795 | 23,959 | 24,092 | 23,998 |
| Total | 47,860 | 43,016 | 47,197 | 48,108 | 50,199 |
| District 4: | | | | | |
| Colorado | 4,225 | 4,441 | 4,148 | 4,580 | 4,074 |
| Idaho | 4,055 | 4,037 | 4,204 | 4,108 | 4,501 |
| Montana | 4,877 | 5,248 | 5,522 | 5,400 | 5,684 |
| Utah | 3,841 | 3,065. | 3,607 | 3,640 | 3,766 |
| Wyoming | 3,258 | 3,250 | 3,838 | 3,816 | 3,653 |
| Total | 20,256 | 20,061 | 21,319 | 21,544 | 21,678 |
| District 5: | | | | | |
| Alaska | 2,616 | 2,849 | 2,897 | 3,076 | 3,482 |
| Arizona | 2,774 | 3,107 | 3,001 | 3,520 | 3,528 |
| California | 26,697 | 27,410 | 29,685 | 32,256 | 34,991 |
| Hawaii | 876 | 1,666 | 1,641 | 1,375 | 1,769 |
| Nevada | 2,428 | 2,985 | 3,017 | 2,844 | 3,523 |
| Oregon | 10,920 | 11,061 | 11,777 | 12,828 | 13,855 |
| Washington | 18,045 | 17,532 | 17,057 | 16,791 | 17,997 |
| Total | 64,356 | 66,610 | 69,075 | 72,690 | 79,145 |
| Total United States | 683,325 | 690,874 | 729,095 | 748,124 | 747,551 |

[1] Includes diesel fuel oil.

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**TABLE 49.—Monthly average prices of distillate fuel oil and diesel fuel in the United States 1963–64**

| Year and grade | January | February | March | April | May | June | July | August | September | October | November | December | Average for year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| No. 2 fuel oil at refineries, Oklahoma, cents per gallon | 9.69 | 10.13 | 10.08 | 10.00 | 9.92 | 9.88 | 9.88 | 9.88 | 9.88 | 9.88 | 9.88 | 9.88 | 9.91 |
| No. 2 fuel oil at New York Harbor, cents per gallon | 10.53 | 10.50 | 10.44 | 10.28 | 9.52 | 9.50 | 9.50 | 9.40 | 9.25 | 9.29 | 9.40 | 9.99 | 9.80 |
| Diesel oil, shore plants, New York, cents per gallon | 10.87 | 10.41 | 10.41 | 10.83 | 9.87 | 9.85 | 9.85 | 9.85 | 9.85 | 9.85 | 9.85 | 10.20 | 10.14 |
| Diesel oil for ships: | | | | | | | | | | | | | |
| New York, dollars per barrel | 4.39 | 4.37 | 4.37 | 4.36 | 3.96 | 3.95 | 3.95 | 3.95 | 3.95 | 3.95 | 3.95 | 4.13 | 4.11 |
| New Orleans, do | 4.15 | 4.16 | 4.16 | 4.16 | 3.95 | 3.95 | 3.95 | 3.95 | 3.95 | 3.95 | 3.95 | 3.95 | 4.02 |
| San Pedro, do | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 |
| 1964: | | | | | | | | | | | | | |
| No. 2 fuel oil at refineries, Oklahoma, cents per gallon | 9.88 | 9.88 | 9.68 | 9.38 | 9.38 | 9.38 | 9.38 | 9.38 | 9.38 | 9.38 | 9.38 | 9.50 | 9.49 |
| No. 2 fuel oil at New York Harbor, cents per gallon | 10.14 | 9.99 | 9.75 | 9.00 | 8.85 | 8.80 | 8.80 | 8.80 | 8.80 | 9.00 | 9.19 | 9.55 | 9.22 |
| Diesel oil, shore plants, New York, cents per gallon | 10.50 | 10.50 | 10.33 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.37 | 9.49 | 9.88 | 9.66 |
| Diesel oil for ships: | | | | | | | | | | | | | |
| New York, dollars per barrel | 4.29 | 4.29 | 4.23 | 3.87 | 3.87 | 3.87 | 3.87 | 3.87 | 3.87 | 3.87 | 3.91 | 4.12 | 3.99 |
| New Orleans, do | 4.00 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.09 | 4.07 |
| San Pedro, do | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 | 5.09 |

Source: Platt's Oil Price Handbook.

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## TABLE 50.—Salient statistics of residual fuel oil in the United States, by months and refinery districts

(Thousand barrels unless otherwise stated)

| Month and district | 1963 | | | | | | | 1964 p | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production | Yield (percent) | Crude used directly as residual [1] | Imports | Exports | Stocks (end of period) | Domestic demand | Production | Yield (percent) | Crude used directly as residual [1] | Imports | Exports | Stocks (end of period) | Domestic demand |
| Month: | | | | | | | | | | | | | | |
| January | 27,313 | 10.2 | 266 | 34,803 | 814 | 46,896 | 64,447 | 25,826 | 9.3 | 246 | 39,734 | 1,561 | 45,352 | 66,431 |
| February | 25,334 | 10.0 | 251 | 28,711 | 1,477 | 43,627 | 56,088 | 22,747 | 8.8 | 372 | 29,187 | 1,023 | 43,262 | 53,373 |
| March | 25,406 | 9.4 | 246 | 23,903 | 1,060 | 42,867 | 49,255 | 22,298 | 8.3 | 236 | 24,712 | 1,668 | 39,100 | 49,740 |
| April | 21,481 | 8.6 | 269 | 24,663 | 1,315 | 44,685 | 43,280 | 21,231 | 8.3 | 363 | 27,970 | 2,000 | 38,477 | 48,187 |
| May | 21,000 | 8.1 | 264 | 19,019 | 1,338 | 46,648 | 36,982 | 20,821 | 7.7 | 285 | 19,797 | 1,375 | 40,459 | 37,546 |
| June | 21,811 | 8.2 | 285 | 15,281 | 967 | 48,100 | 34,958 | 19,519 | 7.2 | 276 | 17,748 | 1,942 | 40,356 | 35,704 |
| July | 21,748 | 7.8 | 251 | 18,132 | 1,123 | 50,885 | 36,223 | 21,556 | 7.5 | 270 | 20,460 | 1,498 | 42,977 | 38,167 |
| August | 21,795 | 7.8 | 295 | 16,922 | 1,358 | 52,456 | 36,083 | 21,114 | 7.4 | 313 | 18,447 | 1,547 | 44,644 | 36,660 |
| September | 21,521 | 8.1 | 264 | 16,010 | 1,719 | 52,624 | 35,908 | 21,280 | 7.9 | 365 | 18,915 | 1,517 | 45,364 | 38,323 |
| October | 21,031 | 7.8 | 273 | 22,951 | 959 | 54,359 | 41,561 | 22,543 | 8.2 | 261 | 24,712 | 1,879 | 45,936 | 45,065 |
| November | 22,501 | 8.6 | 259 | 20,749 | 1,829 | 52,250 | 43,789 | 23,545 | 8.9 | 286 | 23,342 | 1,321 | 46,135 | 45,653 |
| December | 24,969 | 9.1 | 382 | 31,609 | 1,322 | 47,538 | 60,350 | 25,702 | 9.1 | 447 | 30,867 | 1,539 | 40,403 | 61,209 |
| Total | 275,910 | 8.6 | 3,305 | 272,753 | 15,281 | 47,538 | 538,924 | 268,182 | 8.2 | 3,720 | 295,891 | 18,870 | 40,403 | 556,058 |
| District: | | | | | | | | | | | | | | |
| East Coast | 40,309 | 8.9 | 26 | 252,785 | 68 | 10,318 | NA | 37,291 | 8.3 | 35 | 274,426 | 66 | 10,213 | NA |
| Appalachian No. 1 | 3,882 | 10,1 | ---- | | | 347 | | 3,864 | 9.7 | ---- | | | 459 | |
| Appalachian No. 2 | 3,431 | 9.3 | ---- | | | 259 | | 3,569 | 9.5 | ---- | | | 137 | |
| Indiana, Illinois, Kentucky, etc | 51,295 | 9.0 | 197 | 800 | 168 | 6,518 | | 48,567 | 8.4 | 189 | 804 | 226 | 6,726 | |
| Minnesota, Wisconsin, etc | 6,209 | 12.7 | 39 | | | 595 | | 6,257 | 11.6 | 36 | | | 502 | |
| Oklahoma, Kansas, etc | 6,124 | 2.2 | 360 | | | 856 | | 4,532 | 1.7 | 362 | | | 851 | |
| Texas Inland | 4,642 | 4.1 | 341 | | | 2,339 | | 4,342 | 3.7 | 343 | | | 2,350 | |
| Texas Gulf Coast | 35,744 | 4.8 | 516 | | | 3,581 | | 32,249 | 4.2 | 516 | | | 2,928 | |
| Louisiana Gulf Coast | 14,378 | 5.0 | 635 | 12,327 | 4,012 | 1,162 | | 17,540 | 5.5 | 638 | 11,204 | 3,068 | 1,306 | |
| Arkansas, Louisiana Inland, etc | 2,205 | 4.9 | 200 | | | 150 | | 2,280 | 5.0 | 213 | | | 80 | |
| New Mexico | 671 | 6.7 | 83 | | | 23 | | 423 | 3.9 | 84 | | | 19 | |
| Rocky Mountain | 13,614 | 12.1 | 276 | 26 | 1 | 786 | | 12,947 | 11.1 | 273 | 45 | 1 | 821 | |
| West Coast | 93,406 | 19.9 | 632 | 6,815 | 11,032 | 20,604 | | 94,321 | 19.6 | 1,031 | 9,412 | 15,509 | 14,011 | |
| Total | 275,910 | 8.6 | 3,305 | 272,753 | 15,281 | 47,538 | 538,924 | 268,182 | 8.2 | 3,720 | 295,891 | 18,870 | 40,403 | 556,058 |

p Preliminary. NA Not available.
[1] Represents crude oil used as fuel on leases and for general industrial purposes.

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## RESIDUAL FUEL OIL

The total demand for residual fuel oil in 1964 was 574,928,000 barrels. This includes a domestic demand of 556,058,000 barrels, and 18,870,000 barrels that was exported. Total demand increased 3.7 percent for the year, reflecting an increase of 3.2 percent in domestic demand and an increase of 23.5 percent in exports.

The supply of residual fuel oil available from domestic sources declined in 1964, though not as much as in 1963, and additional imports were needed to meet demand requirements. The refinery output of residual declined at an average rate of 21,000 barrels per day in 1964. Imports rose from 747,000 barrels per day in 1963 to 808,000 barrels per day in 1964, an increase of 8.5 percent. Imports subject to quota regulations of the Oil Imports Administration totaled 628,000 barrels daily in 1964, compared with 561,000 barrels for 1963. Residual fuel oil imported in bond for use as bunker fuel for vessels engaged in foreign trade, imports by the military for offshore use, imports from Puerto Rico, and overland receipts from Canada and Mexico are exempt from the quota regulations.

During 1964 residual fuel oil shipments from the gulf coast to PAD District I totaled 31,377,000 barrels, slightly less than corresponding shipments in 1963.

The average tanker rate for Bunker "C" fuel oil from the gulf coast to destinations north of Cape Hatteras was 48.4 cents per barrel in 1964, compared with 50.1 cents in 1963.

**TABLE 51.—Consumption of residual fuel oil[1] in the United States, by uses**

(Thousand barrels)

| | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| Heating oils | 125,088 | 121,097 | 125,164 | 125,248 | 126,215 |
| Industrial (excluding oil company fuel) | 157,270 | 153,766 | 156,221 | 149,269 | 157,176 |
| Oil-company use (excluding heating oil) | 45,061 | 44,399 | 45,978 | 46,976 | 43,098 |
| Gas and electric public utility powerplants | 85,408 | 87,881 | 88,261 | 91,615 | 97,595 |
| Railroads | 5,610 | 5,347 | 5,501 | 5,342 | 5,350 |
| Bunkering of vessels (including company tankers but excluding military) | 94,084 | 87,308 | 84,415 | 76,502 | 83,024 |
| Military use (U.S. Army, Navy, Air Force, and Marine Corps) | 31,724 | 36,762 | 35,667 | 36,444 | 35,568 |
| Miscellaneous uses | 6,291 | 6,425 | 7,226 | 7,126 | 8,606 |
| Total United States | 550,536 | 542,986 | 548,433 | 538,522 | 556,632 |

[1] Includes Navy grade and crude oil burned as fuel.

## LUBRICANTS

The domestic demand for lubricants in 1964 was 5.1 percent higher than in 1963, however, exports decreased 0.9 percent, and total demand for the year was up 3.3 percent.

There were no changes in the posted prices of lubricating oils in 1964.

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**TABLE 52.—Consumption of residual fuel oil[1] in the United States, by PAD districts and States**

(Thousand barrels)

| District and State | 1960 | 1961 | 1962 | 1963 | 1964 |
|---|---|---|---|---|---|
| District 1: | | | | | |
| Connecticut | 14,450 | 14,549 | 16,019 | 16,260 | 19,848 |
| Delaware | 6,081 | 4,986 | 4,775 | 4,707 | 4,473 |
| District of Columbia | 2,387 | 1,955 | 2,243 | 2,533 | 3,914 |
| Florida | 28,978 | 32,600 | 37,044 | 36,668 | 39,425 |
| Georgia | 6,413 | 5,048 | 5,285 | 5,663 | 7,049 |
| Maine | 5,742 | 6,366 | 5,985 | 5,332 | 7,546 |
| Maryland | 16,490 | 12,955 | 13,751 | 13,270 | 14,444 |
| Massachusetts | 38,942 | 40,242 | 41,852 | 37,693 | 43,320 |
| New Hampshire | 2,324 | 2,067 | 2,545 | 2,524 | 2,588 |
| New Jersey | 42,791 | 42,990 | 50,422 | 50,539 | 50,135 |
| New York | 76,586 | 83,518 | 89,667 | 88,606 | 84,596 |
| North Carolina | 4,537 | 4,738 | 3,725 | 3,318 | 3,781 |
| Pennsylvania | 42,731 | 38,970 | 41,422 | 42,245 | 43,636 |
| Rhode Island | 9,502 | 7,543 | 8,274 | 8,177 | 8,218 |
| South Carolina | 4,634 | 5,031 | 5,908 | 5,833 | 5,050 |
| Vermont | 498 | 540 | 629 | 607 | 413 |
| Virginia | 17,448 | 14,195 | 13,225 | 14,055 | 15,516 |
| West Virginia | 1,451 | 1,216 | 1,480 | 1,572 | 2,297 |
| Total | 321,985 | 319,509 | 344,251 | 339,602 | 356,249 |
| District 2: | | | | | |
| Illinois | 25,893 | 25,750 | 24,756 | 25,582 | 21,411 |
| Indiana | 12,885 | 11,988 | 10,736 | 10,756 | 11,464 |
| Iowa | 1,021 | 1,032 | 873 | 931 | 1,034 |
| Kansas | 2,249 | 1,433 | 1,533 | 1,565 | 1,127 |
| Kentucky | 321 | 278 | 389 | 460 | 559 |
| Michigan | 11,242 | 9,896 | 9,275 | 9,746 | 8,905 |
| Minnesota | 6,363 | 5,524 | 6,307 | 6,102 | 5,671 |
| Missouri | 3,026 | 2,638 | 2,131 | 2,335 | 2,400 |
| Nebraska | 378 | 419 | 626 | 1,133 | 958 |
| North Dakota | 663 | 552 | 524 | 553 | 678 |
| Ohio | 11,382 | 9,023 | 8,227 | 7,790 | 9,233 |
| Oklahoma | 1,396 | 873 | 967 | 797 | 825 |
| South Dakota | 60 | 36 | 152 | 245 | 106 |
| Tennessee | 184 | 171 | 105 | 275 | 287 |
| Wisconsin | 4,275 | 4,028 | 3,813 | 4,110 | 4,145 |
| Total | 81,338 | 73,641 | 70,414 | 72,380 | 68,803 |
| District 3: | | | | | |
| Alabama | 4,202 | 3,555 | 2,749 | 3,184 | 2,274 |
| Arkansas | 474 | 379 | 566 | 864 | 750 |
| Louisiana | 8,599 | 8,537 | 6,563 | 6,653 | 7,293 |
| Mississippi | 339 | 338 | 474 | 878 | 826 |
| New Mexico | 173 | 311 | 323 | 209 | 146 |
| Texas | 22,102 | 21,437 | 18,711 | 17,485 | 17,509 |
| Total | 35,889 | 34,557 | 29,386 | 29,273 | 28,798 |
| District 4: | | | | | |
| Colorado | 1,790 | 2,465 | 2,497 | 2,572 | 2,617 |
| Idaho | 201 | 422 | 223 | 260 | 433 |
| Montana | 2,022 | 2,533 | 3,049 | 2,836 | 2,356 |
| Utah | 5,562 | 5,654 | 6,048 | 5,790 | 5,502 |
| Wyoming | 1,738 | 2,555 | 3,288 | 2,490 | 2,241 |
| Total | 11,313 | 13,629 | 15,105 | 13,948 | 13,149 |
| District 5: | | | | | |
| Alaska | 695 | 641 | 715 | 742 | 800 |
| Arizona | 95 | 94 | 117 | 60 | 113 |
| California | 78,774 | 81,587 | 68,949 | 62,842 | 66,927 |
| Hawaii | 5,613 | 6,646 | 6,716 | 6,940 | 7,539 |
| Nevada | 202 | 258 | 165 | 180 | 133 |
| Oregon | 5,453 | 4,879 | 4,989 | 4,930 | 5,314 |
| Washington | 9,179 | 7,545 | 7,626 | 7,625 | 8,807 |
| Total | 100,011 | 101,650 | 89,277 | 83,319 | 89,633 |
| Total United States | 550,536 | 542,986 | 548,433 | 538,522 | 556,632 |

[1] Includes some crude oil burned as fuel.

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## TABLE 53.—Monthly average prices of residual fuel oil in the United States, 1963–64

(Dollars per barrel)

| Year and grade | January | February | March | April | May | June | July | August | September | October | November | December | Average for year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| No. 6 fuel oil at refineries, Oklahoma | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 |
| No. 5 fuel oil at New York Harbor | 2.85 | 2.85 | 2.85 | 2.85 | 2.85 | 2.85 | 2.85 | 2.85 | 2.85 | 2.85 | 2.85 | 2.87 | 2.85 |
| Bunker "C" for ships: | | | | | | | | | | | | | |
| New York | 2.31 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 |
| New Orleans | 2.20 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 |
| San Pedro | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.21 | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 | 2.24 |
| 1964: | | | | | | | | | | | | | |
| No. 6 fuel oil at refineries, Oklahoma | 2.10 | 2.10 | 2.10 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.08 | 2.03 |
| No. 5 fuel oil at New York Harbor | 2.89 | 2.89 | 2.87 | 2.84 | 2.84 | 2.84 | 2.84 | 2.84 | 2.84 | 2.84 | 2.83 | 2.78 | 2.84 |
| Bunker "C" for ships: | | | | | | | | | | | | | |
| New York | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 |
| New Orleans | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 | 2.19 |
| San Pedro | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 |

Source: Platt's Oil Price Handbook.

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## TABLE 54.—Salient statistics of lubricants in the United States, by months and districts

(Thousand barrels unless otherwise stated)

| Month and district | 1963 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production | | | | Yield (percent) | Imports (all types) | Exports (all types) | Stocks, end of period | | | | Domestic demand (all types) |
| | Bright stock | Neutral | Other grades | Total | | | | Bright stock | Neutral | Other grades | Total | |
| By months: | | | | | | | | | | | | |
| January | 653 | 2,038 | 2,419 | 5,110 | 1.9 | | 1,124 | 1,350 | 3,548 | 8,445 | 13,343 | 3,773 |
| February | 599 | 1,981 | 2,264 | 4,844 | 1.9 | 2 | 1,345 | 1,570 | 3,698 | 8,515 | 13,783 | 3,061 |
| March | 582 | 2,181 | 2,359 | 5,122 | 1.9 | 3 | 1,402 | 1,614 | 3,895 | 8,638 | 14,147 | 3,359 |
| April | 780 | 1,890 | 2,536 | 5,206 | 2.1 | | 1,858 | 1,653 | 3,770 | 8,255 | 13,678 | 3,817 |
| May | 598 | 2,091 | 2,789 | 5,478 | 2.1 | 2 | 1,810 | 1,464 | 3,662 | 8,114 | 13,240 | 4,108 |
| June | 659 | 1,864 | 2,729 | 5,252 | 1.9 | 2 | 1,308 | 1,424 | 3,643 | 8,313 | 13,380 | 3,806 |
| July | 679 | 2,153 | 2,738 | 5,570 | 2.0 | 2 | 1,771 | 1,399 | 3,685 | 8,363 | 13,447 | 3,734 |
| August | 533 | 2,041 | 2,848 | 5,422 | 2.0 | 4 | 1,463 | 1,379 | 3,707 | 8,364 | 13,450 | 3,960 |
| September | 634 | 1,970 | 2,763 | 5,367 | 2.0 | 3 | 1,567 | 1,565 | 3,756 | 8,494 | 13,815 | 3,438 |
| October | 563 | 2,199 | 2,671 | 5,433 | 2.0 | 2 | 1,482 | 1,555 | 3,926 | 7,954 | 13,435 | 4,333 |
| November | 621 | 2,118 | 2,575 | 5,314 | 2.1 | 1 | 1,391 | 1,593 | 3,984 | 8,458 | 14,035 | 3,324 |
| December | 524 | 2,108 | 2,336 | 4,968 | 1.8 | 2 | 1,796 | 1,567 | 4,500 | 8,254 | 14,321 | 2,888 |
| Total | 7,425 | 24,634 | 31,027 | 63,086 | 2.0 | 23 | 18,317 | 1,567 | 4,500 | 8,254 | 14,321 | 43,601 |
| By districts: | | | | | | | | | | | | |
| East Coast | 1,148 | 2,971 | 3,841 | 7,960 | 1.8 | 14 | | 334 | 589 | 2,342 | 3,265 | |
| Appalachian No. 1 | 1,212 | 1,459 | 644 | 3,315 | 8.6 | | | 237 | 328 | 271 | 836 | |
| Appalachian No. 2 | | 266 | 149 | 415 | 1.1 | | | 3 | 35 | 112 | 150 | |
| Indiana, Illinois, Kentucky, etc | 957 | 4,049 | 310 | 5,316 | .9 | 6 | | 74 | 616 | 1,198 | 1,888 | |
| Minnesota, Wisconsin, etc | | | | | | | | | | 27 | 27 | |
| Oklahoma, Kansas, etc | 1,053 | 2,790 | 1,207 | 5,050 | 1.9 | | 16,798 | 271 | 343 | 209 | 823 | |
| Texas Inland | | | 156 | 156 | .2 | | | | | 39 | 39 | NA |
| Texas Gulf Coast | 1,810 | 5,452 | 18,072 | 25,334 | 3.5 | | | 289 | 1,373 | 2,565 | 4,227 | |
| Louisiana Gulf Coast | 809 | 5,753 | 1,150 | 7,712 | 2.7 | 2 | | 28 | 575 | 202 | 805 | |
| Arkansas, Louisiana Inland | | 96 | 1,820 | 1,916 | 4.3 | | | | 10 | 352 | 362 | |
| New Mexico | | | | | | | | | | 3 | 3 | |
| Rocky Mountain | 49 | 233 | 82 | 364 | .3 | 1 | | 8 | 58 | 47 | 113 | |
| West Coast | 387 | 1,565 | 3,596 | 5,548 | 1.1 | | 1,519 | 323 | 573 | 887 | 1,783 | |
| Total | 7,425 | 24,634 | 31,027 | 63,086 | 2.0 | 23 | 18,317 | 1,567 | 4,500 | 8,254 | 14,321 | 43,601 |

See footnotes at end of table.

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| By months: | | | | | | | | | | | | | |
| January | 667 | 1,760 | 2,723 | 5,150 | 1.9 | 4 | 1,202 | 1,809 | 4,082 | 8,400 | 14,291 | 3,982 |
| February | 519 | 1,705 | 2,604 | 4,828 | 1.9 | 2 | 1,436 | 1,803 | 4,038 | 8,489 | 14,330 | 3,355 |
| March | 548 | 2,019 | 2,640 | 5,207 | 1.9 | 3 | 1,366 | 1,760 | 4,172 | 8,467 | 14,399 | 3,775 |
| April | 535 | 2,063 | 2,687 | 5,285 | 2.1 | 4 | 1,980 | 1,571 | 3,633 | 8,114 | 13,318 | 4,390 |
| May | 492 | 1,896 | 3,009 | 5,397 | 2.0 | 2 | 1,276 | 1,887 | 3,400 | 8,551 | 13,538 | 3,603 |
| June | 586 | 1,961 | 2,703 | 5,250 | 1.9 | 5 | 1,637 | 1,787 | 3,237 | 8,118 | 13,142 | 4,314 |
| July | 467 | 2,062 | 2,838 | 5,357 | 1.9 | 4 | 1,650 | 1,629 | 3,103 | 8,153 | 12,885 | 3,968 |
| August | 729 | 1,744 | 2,942 | 5,415 | 1.9 | 2 | 1,691 | 1,529 | 3,214 | 8,146 | 12,889 | 3,722 |
| September | 517 | 2,103 | 2,664 | 5,284 | 2.0 | 3 | 1,246 | 1,554 | 3,523 | 7,929 | 13,006 | 3,924 |
| October | 525 | 2,123 | 2,783 | 5,431 | 2.0 | 5 | 1,659 | 1,497 | 3,556 | 7,990 | 13,043 | 3,740 |
| November | 586 | 2,158 | 2,603 | 5,347 | 2.0 | 1 | 1,479 | 1,596 | 3,747 | 7,980 | 13,323 | 3,589 |
| December | 569 | 2,077 | 3,071 | 5,717 | 2.0 | 2 | 1,538 | 1,609 | 3,967 | 8,486 | 14,062 | 3,442 |
| Total | 6,740 | 23,661 | 33,267 | 63,668 | 2.0 | 37 | 18,160 | 1,609 | 3,967 | 8,486 | 14,062 | 45,804 |
| By districts: | | | | | | | | | | | | |
| East Coast | 936 | 2,525 | 4,614 | 8,075 | 1.8 | 31 | | 226 | 510 | 2,339 | 3,075 | |
| Appalachian No. 1 | 1,041 | 1,430 | 739 | 3,210 | 8.1 | | | 220 | 264 | 278 | 762 | |
| Appalachian No. 2 | 1 | 130 | 268 | 399 | 1.1 | | | 3 | 36 | 97 | 136 | |
| Indiana, Illinois, Kentucky, etc | 1,068 | 4,064 | 477 | 5,609 | .9 | 3 | | 82 | 632 | 1,109 | 1,823 | |
| Minnesota, Wisconsin, etc | | | | | | | | | | 35 | 35 | |
| Oklahoma, Kansas, etc | 857 | 2,920 | 1,048 | 4,825 | 1.8 | | 16,674 | 126 | 475 | 202 | 803 | NA |
| Texas Inland | | | 156 | 156 | .1 | | | | | 37 | 37 | |
| Texas Gulf Coast | 1,872 | 5,462 | 18,598 | 25,932 | 3.5 | | | 281 | 1,039 | 2,752 | 4,072 | |
| Louisiana Gulf Coast | 703 | 5,530 | 1,203 | 7,436 | 2.4 | | | 60 | 773 | 284 | 1,117 | |
| Arkansas, Louisiana Inland, etc | | 67 | 1,945 | 2,012 | 4.3 | | | 21 | 3 | 339 | 363 | |
| New Mexico | | | | | | | | | | 3 | 3 | |
| Rocky Mountain | 42 | 223 | 72 | 337 | .3 | 1 | | 11 | 31 | 42 | 84 | |
| West Coast | 220 | 1,310 | 4,147 | 5,677 | 1.2 | 2 | 1,486 | 579 | 204 | 969 | 1,752 | |
| Total | 6,740 | 23,661 | 33,267 | 63,668 | 2.0 | 37 | 18,160 | 1,609 | 3,967 | 8,486 | 14,062 | 45,804 |

p Preliminary. NA Not Available.



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**TABLE 55.—Average monthly refinery prices of five selected grades of lubricating oil in the United States**

(Cents per gallon)

| Year and grade | January | February | March | April | May | June | July | August | September | October | November | December | Average for year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| Oklahoma: | | | | | | | | | | | | | |
| 200 viscosity, No. 3 color, neutral | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 |
| 150–160 viscosity at 210° bright stock, 10–25 pour test | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 |
| Pennsylvania: | | | | | | | | | | | | | |
| 200 viscosity, No. 3 color, neutral 420–425 flash, 25 pour test | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 2.800 | 28.00 |
| 600 steam-refined, cylinder stock, filterable | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 |
| South Texas: 500 viscosity, No. 2½–3½ color, neutral | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| 1964: | | | | | | | | | | | | | |
| Oklahoma: | | | | | | | | | | | | | |
| 200 viscosity, No. 3 color, neutral | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 | 21.50 |
| 150–160 viscosity at 210° bright stock, 10–25 pour test | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 | 24.50 |
| Pennsylvania: | | | | | | | | | | | | | |
| 200 viscosity, No. 2 color, neutral 420–425 flash, 25 pour test | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 |
| 600 steam-refined, cylinder stock, filterable | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 | 22.00 |
| South Texas: 500 viscosity, No. 2½–3½ color, neutral | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |

Source: Platt's Oil Price Handbook.

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## JET FUEL (MILITARY GRADE)

The jet fuel included in this category represents that used by the military or by aircraft and missile manufactures which are testing equipment for the U.S. Government.

The total demand for military-grade jet fuels in 1964 was 118,751,000 barrels, an increase of 2.9 percent for the year. Production increased 8.6 million barrels in 1964. The increase in production was accompanied by an 18.9 percent decline in imports (2,829,000 barrels) and a stock increase of 1.4 million barrels.

Reporting of military jet fuels by grades was initiated in 1963 and is continuing. The JP–4 grade is a wide-cut gasoline type; JP–5 is a high flashpoint kerosine type; and the other grades include special type jet, jet propellant, and rocket fuels blended to military specifications.

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**TABLE 56.—Salient statistics of military jet fuel in the United States, 1963–64, by months and districts**

(Thousand barrels)

| Month and district | 1963 | | | | | | | | 1964 p | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production | | | | Imports | Exports | Stocks, end of period | Domestic demand | Production | | | | Imports | Exports | Stocks, end of period | Domestic demand |
| | JP-4 grade [1] | JP-5 grade | Other military grades | Total | | | | | JP-4 grade [1] | JP-5 grade | Other military grades | Total | | | | |
| By months: | | | | | | | | | | | | | | | | |
| January | 6,709 | 640 | 331 | 7,680 | 2,034 | 13 | 9,774 | 9,595 | 6,388 | 881 | 512 | 7,781 | 1,948 | 36 | 8,510 | 9,727 |
| February | 6,300 | 400 | 393 | 7,093 | 405 | 20 | 8,979 | 8,273 | 6,682 | 872 | 354 | 7,908 | 931 | 13 | 8,982 | 8,354 |
| March | 6,979 | 1,071 | 309 | 8,359 | | 9 | 9,792 | 7,537 | 7,521 | 1,209 | 405 | 9,135 | 1,231 | 14 | 9,882 | 9,452 |
| April | 6,697 | 1,200 | 298 | 8,195 | 863 | 33 | 9,287 | 9,530 | 7,502 | 954 | 408 | 8,864 | 707 | 14 | 9,158 | 10,281 |
| May | 7,156 | 1,147 | 295 | 8,598 | 2,114 | 10 | 9,628 | 10,361 | 7,897 | 1,074 | 530 | 9,501 | 1,131 | 11 | 9,331 | 10,448 |
| June | 7,412 | 1,181 | 359 | 8,952 | 149 | 10 | 10,180 | 8,539 | 8,183 | 1,336 | 358 | 9,877 | 1,242 | 11 | 8,580 | 11,859 |
| July | 7,476 | 1,095 | 543 | 9,114 | 1,655 | 9 | 10,245 | 10,695 | 8,378 | 1,166 | 471 | 10,015 | 1,213 | 12 | 9,497 | 10,299 |
| August | 7,351 | 1,174 | 377 | 8,902 | 2,329 | 12 | 9,619 | 11,845 | 8,593 | 1,360 | 440 | 10,393 | 1,550 | 9 | 10,701 | 10,730 |
| September | 6,885 | 1,212 | 444 | 8,541 | 1,312 | 11 | 9,310 | 10,151 | 7,747 | 922 | 227 | 8,896 | 640 | 12 | 9,577 | 10,648 |
| October | 6,641 | 590 | 603 | 7,834 | 2,403 | 13 | 8,589 | 10,945 | 7,195 | 1,202 | 322 | 8,719 | 542 | 9 | 9,073 | 9,756 |
| November | 7,110 | 881 | 345 | 8,336 | 1,004 | 39 | 8,912 | 8,978 | 7,215 | 1,061 | 415 | 8,691 | 852 | 13 | 8,907 | 9,696 |
| December | 6,473 | 850 | 433 | 7,756 | 679 | 15 | 8,544 | 8,788 | 7,175 | 640 | 398 | 8,213 | 131 | 16 | 9,904 | 7,331 |
| Total | 83,189 | 11,441 | 4,730 | 99,360 | 14,947 | 194 | 8,544 | 115,237 | 90,476 | 12,677 | 4,840 | 107,993 | 12,118 | 170 | 9,904 | 118,581 |
| By districts: | | | | | | | | | | | | | | | | |
| East Coast | 2,353 | | 220 | 2,573 | 13,308 | | 473 | | 1,565 | 462 | 173 | 2,200 | 10,804 | | 483 | |
| Appalachian No. 1 | 318 | | | 318 | | | 9 | | 270 | | | 270 | | | 13 | |
| Appalachian No. 2 | 97 | 92 | | 189 | | | 156 | | 124 | 273 | | 397 | | | 46 | |
| Indiana, Illinois, Kentucky, etc. | 9,132 | 337 | 1,821 | 11,290 | | | 778 | | 9,003 | 260 | 1,970 | 11,233 | | | 938 | |
| Minnesota, Wisconsin, North and South Dakota | 1,723 | | 217 | 1,940 | | | 221 | | 1,941 | | | 1,941 | | | 227 | |
| Oklahoma, Kansas, Missouri, etc. | 12,253 | 775 | 233 | 13,261 | | 66 | 1,090 | NA | 10,860 | 708 | 499 | 12,067 | | 19 | 995 | NA |
| Texas Inland | 11,025 | 260 | 875 | 12,160 | | | 604 | | 12,604 | 270 | 791 | 13,665 | | | 869 | |
| Texas Gulf | 12,181 | 3,303 | 1,040 | 16,524 | | | 1,066 | | 14,931 | 3,488 | 1,057 | 19,476 | | | 1,994 | |
| Louisiana Gulf Coast | 10,068 | 2,128 | 232 | 12,428 | | | 1,167 | | 12,953 | 1,956 | 262 | 15,171 | | | 1,223 | |
| Arkansas, Louisiana Inland, etc. | 1,551 | | 92 | 1,643 | | | 194 | | 1,537 | | 88 | 1,625 | | | 284 | |
| New Mexico | 1,556 | 8 | | 1,564 | | | 165 | | 1,373 | | | 1,373 | | | 152 | |
| Rocky Mountain | 5,789 | | | 5,789 | | | 611 | | 5,944 | | | 5,944 | | | 587 | |
| West Coast | 15,143 | 4,538 | | 19,681 | 1,639 | 128 | 2,010 | | 17,371 | 5,260 | | 22,631 | 1,314 | 151 | 2,093 | |
| Total | 83,189 | 11,441 | 4,730 | 99,360 | 14,947 | 194 | 8,544 | 115,237 | 90,476 | 12,677 | 4,840 | 107,993 | 12,118 | 170 | 9,904 | 118,581 |

p Preliminary. NA Not Available.

[1] Includes military jet fuel produced at natural gas liquid plants: Texas Gulf, 1963—49; 1964—114; Arkansas, Louisiana Inland, etc., 1963—566; 1964—295.

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## LIQUEFIED GASES, ETHANE, AND ETHYLENE

Liquefied gases are derived from two sources. The gas produced at refineries is called liquefied refinery gas to distinguish it from natural gas, which is called liquefied petroleum gas. The liquefied petroleum gases (LPG) are all saturated (that is, propane, butane, etc.). The liquefied refinery gases (LRG) may contain unsaturated compounds or olefine (that is, propylene, butylene, etc.). The olefins are used as feedstock for chemical plants. The saturated gases may be used as chemical raw materials or as fuel. Beginning with 1963, separate data have been collected on liquefied refinery gas used as fuel and that used as raw material for petrochemical feedstocks. Liquefied gases are also used in producing gasoline and are reported in this chapter as natural gas liquids used at refineries or as gasoline. Although ethane and ethylene are not defined as liquefied gases, the statistics on these products are in some cases reported with those of LPG and LRG.

The production of liquefied gases, ethane, and ethylene (but excluding LRG used as petrochemical feedstocks) in 1964 was 315.0 million barrels. This included 59.2 million barrels produced at petroleum refineries and 255.8 million barrels produced at natural-gas-processing plants. The total demand for liquefied gases in 1964 was 250.4 million barrels. This excludes 64.4 million barrels delivered from natural-gas-processing plants and terminals for blending into motor fuel, and 47.2 million barrels of LRG used as petrochemical feedstocks.

More detailed information on liquefied gases may be found in the chapter on natural gas liquids.

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**TABLE 57.—Salient statistics of liquefied gases and ethane in the United States, by months and districts[1]**

(Thousand barrels unless otherwise stated)

| Month and district | 1963 | | | | | | | 1964 p | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Refinery production | Yield (percent) | Transfers from gasoline plants | Imports | Exports | Stocks, end of period | Domestic demand | Refinery production | Yield (percent) | Transfers from gasoline plants | Imports | Exports | Stocks, end of period | Domestic demand |
| By months: | | | | | | | | | | | | | | |
| January | 7,279 | 2.6 | 22,952 | 346 | 362 | 3,307 | 31,677 | 8,874 | 3.2 | 22,110 | 420 | 404 | 3,272 | 31,614 |
| February | 6,767 | 2.7 | 18,749 | 364 | 388 | 2,569 | 26,230 | 8,436 | 3.3 | 17,137 | 447 | 386 | 3,038 | 25,868 |
| March | 7,803 | 2.9 | 14,288 | 220 | 428 | 3,124 | 21,328 | 9,417 | 3.5 | 15,048 | 321 | 433 | 3,355 | 24,036 |
| April | 7,783 | 3.1 | 11,342 | 218 | 358 | 3,611 | 18,498 | 9,046 | 3.5 | 12,330 | 246 | 410 | 3,523 | 21,044 |
| May | 8,211 | 3.1 | 11,333 | 101 | 362 | 4,436 | 18,458 | 8,959 | 3.3 | 11,505 | 185 | 437 | 3,871 | 19,864 |
| June | 8,289 | 3.1 | 10,822 | 50 | 369 | 4,853 | 18,375 | 9,129 | 3.4 | 11,354 | 232 | 498 | 4,291 | 19,797 |
| July | 8,544 | 3.1 | 12,948 | 81 | 396 | 5,100 | 20,930 | 9,273 | 3.2 | 12,824 | 352 | 475 | 4,578 | 21,687 |
| August | 8,545 | 3.1 | 13,102 | 93 | 378 | 5,291 | 21,171 | 8,830 | 3.1 | 14,012 | 266 | 485 | 4,701 | 22,500 |
| September | 7,893 | 3.0 | 12,355 | 180 | 390 | 5,510 | 19,819 | 8,507 | 3.1 | 14,093 | 298 | 413 | 4,569 | 22,617 |
| October | 7,829 | 2.9 | 13,755 | 237 | 379 | 5,311 | 21,641 | 8,912 | 3.2 | 16,338 | 416 | 426 | 4,951 | 24,858 |
| November | 7,676 | 2.9 | 16,787 | 252 | 364 | 5,093 | 24,569 | 8,192 | 3.1 | 17,076 | 410 | 462 | 4,650 | 25,517 |
| December | 8,738 | 3.2 | 23,609 | 374 | 419 | 3,886 | 33,509 | 8,937 | 3.2 | 22,891 | 535 | 529 | 3,692 | 32,792 |
| Total | 95,357 | 3.0 | 182,042 | 2,516 | 4,593 | 3,886 | 276,205 | 106,512 | 3.3 | 186,718 | 4,128 | 5,358 | 3,692 | 292,194 |
| By districts: | | | | | | | | | | | | | | |
| East Coast | 11,335 | 2.5 | NA | 401 | | 343 | | 12,260 | 2.7 | NA | 308 | | 458 | |
| Appalachian No. 1 | 681 | 1.8 | | | | 10 | | 726 | 1.8 | | | | 9 | |
| Appalachian No. 2 | 430 | 1.1 | | | | 2 | | 453 | 1.2 | | | | 2 | |
| Indiana, Illinois, Kentucky, etc. | 11,895 | 2.1 | NA | 1,097 | | 547 | | 13,476 | 2.3 | NA | 2,509 | | 624 | |
| Minnesota, Wisconsin, North and South Dakota | 1,059 | 2.2 | | | | 14 | | 1,154 | 2.1 | | | 4,430 | 16 | |
| Oklahoma, Kansas, etc. | 7,570 | 2.8 | | | 3,722 | 345 | NA | 7,638 | 2.8 | | | | 352 | NA |
| Texas Inland | 2,929 | 2.6 | | | | 95 | | 3,096 | 2.6 | | | | 100 | |
| Texas Gulf Coast | 33,759 | 4.5 | | | | 1,018 | | 40,340 | 5.4 | | 2 | | 910 | |
| Louisiana Gulf Coast | 10,812 | 3.8 | NA | ---------- | | 502 | | 11,384 | 3.6 | NA | | | 313 | |
| Arkansas, Louisiana Inland, etc. | 1,019 | 2.3 | | | | 8 | | 1,878 | 4.1 | | | | 10 | |
| New Mexico | 301 | 3.0 | | | | 4 | | 282 | 2.6 | | | | 4 | |
| Rocky Mountain | 1,634 | 1.5 | NA | 10 | | 23 | | 1,737 | 1.5 | NA | 112 | | 19 | |
| West Coast | 11,933 | 2.5 | NA | 1,008 | 871 | 975 | | 12,088 | 2.5 | NA | 1,197 | 928 | 875 | |
| Total | 95,357 | 3.0 | 182,042 | 2,516 | 4,593 | 3,886 | 276,205 | 106,512 | 3.3 | 186,718 | 4,128 | 5,358 | 3,692 | 292,194 |

p Preliminary. NA Not available.
[1] Includes L.R.G. used as petrochemical feedstocks.

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## ASPHALT AND ROAD OIL

The total demand for asphalt in 1964 was 21,984,000 short tons, an increase of 2.4 percent for the year. Shipments of asphalt and asphaltic products for domestic consumption increased 2.5 percent in 1964. Asphalt for paving purposes declined 1 percent, whereas use for roofing and "all other" increased by about 13 percent.

Road oil production declined 6.2 percent in 1964; the demand, or apparent domestic consumption, declined 5.3 percent, and stocks declined 23 percent. Production for the year was 6,371,000 barrels and demand totaled 6,545,000 barrels.

**TABLE 58.—Statistical summary of petroleum asphalt and road oil**

(Thousand short tons) [1]

| | 1960 | 1961 | 1962 | 1963 | p 1964 |
|---|---|---|---|---|---|
| Petroleum asphalt: | | | | | |
| Production | 17,940 | 18,513 | 19,923 | 20,354 | 20,887 |
| Imports (including natural) | 1,117 | 1,201 | 1,204 | 1,130 | 1,075 |
| Exports | 168 | 121 | 150 | 128 | 139 |
| Stocks (end of period) | 2,362 | 2,363 | 2,591 | 2,610 | 2,588 |
| Apparent domestic consumption | 18,518 | 19,592 | 20,749 | 21,337 | 21,845 |
| Petroleum asphalt shipments: | | | | | |
| Paving | 14,674 | 15,318 | 16,322 | 16,947 | 16,771 |
| Roofing | 3,525 | 3,635 | 3,842 | 3,821 | 4,394 |
| All other | 1,855 | 1,755 | 1,932 | 1,879 | 2,043 |
| Total | 20,054 | 20,708 | 22,096 | 22,647 | 23,208 |
| Road oil: | | | | | |
| Production | 1,085 | 1,058 | 1,287 | 1,235 | 1,158 |
| Stocks (end of period) | 135 | 138 | 159 | 137 | 105 |
| Apparent domestic consumption | 1,069 | 1,055 | 1,266 | 1,257 | 1,190 |
| Road oil shipments | 1,177 | 1,083 | 1,109 | r 1,099 | 1,139 |

p Preliminary. r Revised.
[1] Converted from barrels to short tons (5.5 barrels=1 short ton).

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## TABLE 59.—Salient statistics of petroleum asphalt in the United States, by months and districts

(Thousand short tons) [1]

| Month and district | 1963 | | | | | p 1964 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Production | Imports (including natural) | Exports | Stocks (end of period) | Domestic demand | Production | Imports (including natural) | Exports | Stocks (end of period) | Domestic demand |
| Month: | | | | | | | | | | |
| January | 902 | 87 | 1 | 2,967 | 611 | 806 | 64 | 9 | 2,875 | 596 |
| February | 834 | 40 | 9 | 3,314 | 518 | 1,010 | 25 | 9 | 3,298 | 605 |
| March | 1,185 | 77 | 8 | 3,769 | 799 | 1,325 | 42 | 8 | 3,866 | 791 |
| April | 1,564 | 85 | 7 | 4,336 | 1,075 | 1,454 | 50 | 14 | 4,058 | 1,297 |
| May | 2,010 | 90 | 11 | 3,809 | 2,617 | 2,031 | 89 | 7 | 4,000 | 2,170 |
| June | 2,200 | 117 | 6 | 3,609 | 2,511 | 2,317 | 191 | 17 | 3,668 | 2,823 |
| July | 2,341 | 126 | 8 | 3,057 | 3,012 | 2,469 | 151 | 11 | 3,241 | 3,037 |
| August | 2,397 | 149 | 13 | 2,635 | 2,955 | 2,483 | 105 | 10 | 2,791 | 3,028 |
| September | 2,247 | 107 | 8 | 2,323 | 2,658 | 2,268 | 108 | 19 | 2,324 | 2,824 |
| October | 2,052 | 111 | 18 | 1,885 | 2,583 | 2,129 | 95 | 10 | 2,012 | 2,526 |
| November | 1,488 | 53 | 10 | 2,159 | 1,256 | 1,490 | 82 | 14 | 2,128 | 1,440 |
| December | 1,134 | 88 | 29 | 2,610 | 742 | 1,105 | 73 | 11 | 2,588 | 708 |
| Total | 20,354 | 1,130 | 128 | 2,610 | 21,337 | 20,887 | 1,075 | 139 | 2,588 | 21,845 |
| District: | | | | | | | | | | |
| East Coast | 4,748 | NA | 108 | 738 | NA | 4,827 | NA | 108 | 694 | NA |
| Appalachian No. 1 | 303 | | | 76 | | 299 | | | 47 | |
| Appalachian No. 2 | 579 | | | 44 | | 572 | | | 72 | |
| Illinois, Indiana, Kentucky, etc. | 3,881 | | | 410 | | 3,989 | | | 399 | |
| Minnesota, Wisconsin, North Dakota | 288 | | | 23 | | 326 | | | 24 | |
| Oklahoma, Kansas, etc. | 1,993 | | | 281 | | 2,132 | | | 306 | |
| Texas Inland | 995 | | | 103 | | 1,005 | | | 94 | |
| Texas Gulf Coast | 1,416 | | | 99 | | 1,406 | | | 86 | |
| Louisiana Gulf Coast | 977 | | | 145 | | 859 | | | 146 | |
| Arkansas, Louisiana Inland, etc. | 1,014 | | | 130 | | 1,017 | | | 138 | |
| New Mexico | 109 | | | 21 | | 141 | | | 21 | |
| Rocky Mountain | 1,188 | | | 201 | | 1,348 | | | 224 | |
| West Coast | 2,863 | NA | 20 | 339 | | 2,966 | NA | 31 | 337 | |
| Total | 20,354 | 1,130 | 128 | 2,610 | 21,337 | 20,887 | 1,075 | 139 | 2,588 | 21,845 |

p Preliminary. NA Not available.
[1] Converted from barrels to short tons (5.5 barrels = 1 short ton).

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**TABLE 60.—Salient statistics of road oil in the United States, by months and refinery districts**

(Short tons)[1]

| Month and district | 1963 | | | 1964 p | | |
|---|---|---|---|---|---|---|
| | Production | Stocks (end of period) | Domestic demand | Production | Stocks (end of period) | Domestic demand |
| Month: | | | | | | |
| January | 38,909 | 176,182 | 21,818 | 28,182 | 154,364 | 10,727 |
| February | 33,636 | 186,909 | 22,909 | 34,182 | 176,727 | 11,818 |
| March | 81,454 | 239,636 | 28,727 | 98,727 | 260,364 | 15,091 |
| April | 123,273 | 296,364 | 66,545 | 81,273 | 308,364 | 33,273 |
| May | 120,545 | 308,727 | 108,182 | 93,091 | 289,273 | 112,182 |
| June | 192,909 | 306,727 | 194,909 | 172,364 | 273,818 | 187,818 |
| July | 231,091 | 258,909 | 278,909 | 233,091 | 220,000 | 286,909 |
| August | 183,273 | 212,727 | 229,455 | 174,364 | 198,909 | 195,455 |
| September | 106,182 | 171,273 | 147,636 | 93,273 | 155,636 | 136,545 |
| October | 79,636 | 154,727 | 96,182 | 59,636 | 96,182 | 119,091 |
| November | 24,000 | 141,818 | 36,909 | 60,364 | 97,818 | 58,727 |
| December | 20,001 | 136,909 | 24,909 | 29,818 | 105,273 | 22,364 |
| Total | 1,234,909 | 136,909 | 1,257,090 | 1,158,365 | 105,273 | 1,190,000 |
| District: | | | | | | |
| East Coast | 4,727 | ---------- | NA | 3,636 | ---------- | NA |
| Appalachian No. 1 | ---------- | ---------- | | ---------- | ---------- | |
| Appalachian No. 2 | 1,636 | ---------- | | 1,818 | ---------- | |
| Indiana, Illinois, Kentucky, etc. | 334,182 | 8,545 | | 342,182 | 8,909 | |
| Minnesota, Wisconsin, North Dakota | 19,636 | ---------- | | 27,273 | ---------- | |
| Oklahoma, Kansas, etc. | 312,182 | 24,000 | | 322,364 | 24,364 | |
| Texas Inland | ---------- | ---------- | | ---------- | ---------- | |
| Texas Gulf Coast | 2,727 | 545 | | 182 | 364 | |
| Louisiana Gulf Coast | 182 | 182 | | ---------- | ---------- | |
| Arkansas, Louisiana Inland, etc. | ---------- | ---------- | | ---------- | ---------- | |
| New Mexico | ---------- | ---------- | | 364 | ---------- | |
| Rocky Mountain | 346,364 | 25,455 | | 262,728 | 19,636 | |
| West Coast | 213,273 | 78,182 | | 197,818 | 52,000 | |
| Total | 1,234,909 | 136,909 | 1,257,090 | 1,158,365 | 105,273 | 1,190,000 |

p Preliminary. NA Not available.
[1] Converted from barrels to short tons (5.5 barrels = 1 short ton).

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**TABLE 61.—Shipments of petroleum-asphalt paving products for consumption in the United States, by PAD districts and States**

(Short tons)

| District and State | Asphalt cements | | Cutback asphalts | | Emulsified asphalts | | Total | |
|---|---|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| **District 1:** | | | | | | | | |
| Connecticut | 107,284 | 108,345 | 44,639 | 42,301 | 4,658 | 2,586 | 156,581 | 153,232 |
| Delaware | 17,306 | 18,998 | 16,589 | 20,231 | 2,645 | 2,396 | 36,540 | 41,625 |
| Florida | 380,942 | 403,679 | 84,997 | 90,540 | 48,864 | 47,948 | 514,803 | 542,167 |
| Georgia | 438,466 | 341,023 | 107,346 | 88,997 | 58,306 | 38,885 | 604,118 | 508,905 |
| Maine | 64,042 | 78,778 | 56,385 | 64,105 | 17,460 | 18,045 | 137,887 | 160,928 |
| Maryland and District of Columbia | 277,271 | 293,792 | 77,297 | 109,519 | 58,943 | 54,747 | 413,511 | 458,058 |
| Massachusetts | 276,623 | 311,489 | 42,024 | 37,154 | 1,289 | 754 | 319,936 | 349,397 |
| New Hampshire | 43,700 | 67,335 | 50,570 | 48,846 | 59 | 149 | 94,329 | 116,330 |
| New Jersey | 346,898 | 352,162 | 107,830 | 113,990 | 24,782 | 23,250 | 479,510 | 489,402 |
| New York | 628,783 | 651,050 | 362,865 | 242,575 | 133,027 | 110,765 | 1,124,675 | 1,004,390 |
| North Carolina | 197,039 | 225,256 | 68,837 | 74,726 | 135,611 | 122,216 | 401,487 | 422,198 |
| Pennsylvania | 405,900 | 510,268 | 174,159 | 186,373 | 60,411 | 58,640 | 640,470 | 755,281 |
| Rhode Island | 43,335 | 76,052 | 50,778 | 48,408 | 602 | 238 | 94,715 | 124,698 |
| South Carolina | 176,400 | 158,750 | 29,261 | 21,203 | 61,854 | 58,290 | 267,515 | 238,243 |
| Vermont | 23,966 | 12,172 | 13,793 | 18,493 | 244 | 323 | 38,003 | 30,988 |
| Virginia | 250,273 | 305,750 | 94,597 | 110,912 | 46,179 | 37,564 | 391,049 | 454,226 |
| West Virginia | 70,420 | 79,629 | 18,488 | 25,282 | 12,039 | 10,069 | 100,947 | 114,980 |
| Total | 3,748,648 | 4,034,528 | 1,400,455 | 1,343,655 | 666,973 | 586,865 | 5,816,076 | 5,965,048 |
| **District 2:** | | | | | | | | |
| Illinois | 264,812 | 267,708 | 158,578 | 147,427 | 34,872 | 41,748 | 458,262 | 456,883 |
| Indiana | 271,515 | 244,056 | 155,484 | 188,945 | 176,440 | 195,379 | 603,439 | 628,380 |
| Iowa | 232,703 | 272,229 | 91,322 | 76,940 | 69,155 | 80,267 | 393,180 | 429,436 |
| Kansas | 258,553 | 274,820 | 230,138 | 189,944 | 38 | 16,196 | 488,729 | 480,960 |
| Kentucky | 243,812 | 187,811 | 80,233 | 57,850 | 67,065 | 43,597 | 391,110 | 289,258 |
| Michigan | 227,325 | 166,908 | 59,338 | 42,491 | 50,791 | 56,927 | 337,454 | 266,326 |
| Minnesota | 223,036 | 260,263 | 223,417 | 209,694 | 24,086 | 28,601 | 470,539 | 498,558 |
| Missouri | 190,587 | 163,086 | 270,644 | 251,901 | 3,741 | 5,657 | 464,972 | 420,644 |
| Nebraska | 55,092 | 56,947 | 74,254 | 58,739 | 17,148 | 1,511 | 146,494 | 117,197 |
| North Dakota | 95,255 | 89,710 | 69,868 | 68,534 | 39,963 | 19,822 | 205,086 | 178,066 |
| Ohio | 465,417 | 426,708 | 313,046 | 295,010 | 187,258 | 158,818 | 965,721 | 880,536 |
| Oklahoma | 220,733 | 348,708 | 219,403 | 207,765 | 1,982 | 546 | 442,118 | 557,079 |
| South Dakota | 71,911 | 77,842 | 56,818 | 59,916 | 10,498 | 3,083 | 139,227 | 140,841 |
| Tennessee | 278,874 | 353,227 | 60,762 | 40,848 | 31,120 | 41,991 | 370,756 | 436,066 |
| Wisconsin | 185,452 | 171,976 | 103,330 | 77,495 | 5,664 | 8,215 | 294,446 | 257,686 |
| Total | 3,285,077 | 3,362,059 | 2,166,635 | 1,973,499 | 719,821 | 702,358 | 6,171,533 | 6,037,916 |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| District 3: | | | | | | | | |
| Alabama | 185,056 | 190,949 | 73,139 | 82,957 | 77,468 | 63,671 | 335,603 | 337,577 |
| Arkansas | 72,230 | 64,623 | 52,945 | 53,610 | 23,492 | 32,534 | 148,687 | 150,676 |
| Louisiana | 151,656 | 142,858 | 20,199 | 20,607 | 46,034 | 36,532 | 223,889 | 200,087 |
| Mississippi | 119,485 | 113,530 | 56,530 | 54,443 | 31,859 | 33,383 | 207,874 | 201,356 |
| New Mexico | 102,273 | 129,421 | 59,291 | 61,548 | 4,086 | 4,852 | 165,650 | 185,821 |
| Texas | 707,910 | 350,162 | 220,742 | 122,112 | 41,211 | 25,735 | 969,863 | 498,009 |
| Total | 1,338,610 | 991,543 | 488,806 | 385,246 | 224,120 | 196,707 | 2,051,626 | 1,573,496 |
| District 4: | | | | | | | | |
| Colorado | 171,488 | 153,566 | 66,287 | 64,567 | 23 | 7,369 | 237,798 | 225,502 |
| Idaho | 40,085 | 37,880 | 43,279 | 39,050 | 7,674 | 2,722 | 91,038 | 79,652 |
| Montana | 92,263 | 158,719 | 53,670 | 48,621 | 13,773 | 7,281 | 159,706 | 214,621 |
| Utah | 78,375 | 97,472 | 39,919 | 32,151 | | | 118,294 | 129,623 |
| Wyoming | 63,541 | 96,991 | 34,808 | 28,403 | 2,682 | | 101,031 | 125,394 |
| Total | 445,752 | 544,628 | 237,963 | 212,792 | 24,152 | 17,372 | 707,867 | 774,792 |
| District 5: | | | | | | | | |
| Alaska | 5,186 | 12,655 | 7,391 | 6,297 | 2,181 | 3,098 | 14,758 | 22,050 |
| Arizona | 91,892 | 84,118 | 22,123 | 26,198 | 82,334 | 29,442 | 146,349 | 139,758 |
| California | 1,121,846 | 1,324,563 | 145,394 | 96,378 | 131,426 | 134,316 | 1,398,706 | 1,555,257 |
| Hawaii | 21,671 | 30,974 | 718 | 1,709 | 3,715 | 2,333 | 26,104 | 35,076 |
| Nevada | 87,339 | 86,275 | 17,036 | 13,641 | 2,197 | 1,426 | 106,572 | 101,342 |
| Oregon | 187,950 | 233,154 | 41,551 | 47,917 | 17,133 | 30,054 | 246,634 | 311,125 |
| Washington | 153,672 | 162,176 | 96,521 | 80,967 | 10,971 | 11,650 | 261,164 | 254,793 |
| Total | 1,669,596 | 1,933,915 | 330,734 | 273,107 | 199,957 | 212,319 | 2,200,287 | 2,419,401 |
| Total United States | 10,487,683 | 10,866,673 | 4,624,683 | 4,188,359 | 1,835,023 | 1,715,621 | 16,947,389 | 16,770,653 |

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**TABLE 62.—Shipments of petroleum-asphalt roofing products for consumption in the United States, by PAD districts and States**

(Short tons)

| District and State | Asphalt cements and fluxes | | Emulsified asphalts | | Total | |
|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| District 1: | | | | | | |
| Connecticut | 10,541 | 12,357 | | | 10,541 | 12,357 |
| Delaware | 4,765 | 40,077 | | | 4,765 | 40,077 |
| Florida | 85,805 | 117,470 | 2 | 6 | 85,807 | 117,476 |
| Georgia | 189,358 | 186,297 | 114 | 94 | 189,472 | 186,391 |
| Maine | | | | | | |
| Maryland and District of Columbia | 67,867 | 67,865 | 57 | | 67,924 | 67,865 |
| Massachusetts | 58,829 | 59,670 | 2 | 1 | 58,831 | 59,671 |
| New Hampshire | 424 | 892 | | | 424 | 892 |
| New Jersey | 337,724 | 368,754 | | 3 | 337,724 | 368,757 |
| New York | 31,001 | 78,193 | | | 31,001 | 78,193 |
| North Carolina | 43,071 | 82,223 | | 13 | 43,071 | 82,236 |
| Pennsylvania | 186,370 | 197,092 | 1 | 25 | 186,371 | 197,117 |
| Rhode Island | 40,006 | 41,987 | 3 | 1 | 40,009 | 41,988 |
| South Carolina | 61,079 | 69,597 | | 12 | 61,079 | 69,609 |
| Vermont | 18 | 9 | | | 18 | 9 |
| Virginia | 9,265 | 7,980 | 15 | | 9,280 | 7,980 |
| West Virginia | 6,993 | 40,424 | | | 6,993 | 40,424 |
| Total | 1,133,116 | 1,370,887 | 194 | 155 | 1,133,310 | 1,371,042 |
| District 2: | | | | | | |
| Illinois | 509,205 | 868,710 | | 1 | 509,205 | 868,711 |
| Indiana | 124,407 | 122,311 | 1 | | 124,408 | 122,311 |
| Iowa | 5,695 | 4,457 | | | 5,695 | 4,457 |
| Kansas | 39,019 | 18,597 | 112 | | 39,131 | 18,597 |
| Kentucky | 1,418 | 1,738 | 4 | 7 | 1,422 | 1,745 |
| Michigan | 87,323 | 61,847 | | 1 | 87,323 | 61,848 |
| Minnesota | 146,548 | 123,886 | | | 146,548 | 123,886 |
| Missouri | 185,052 | 121,742 | | 1 | 185,052 | 121,743 |
| Nebraska | 10,506 | 6,622 | 43 | 42 | 10,549 | 6,664 |
| North Dakota | 3,097 | 3,747 | | | 3,097 | 3,747 |
| Ohio | 205,830 | 255,430 | 2,702 | 9,900 | 208,532 | 265,330 |
| Oklahoma | 50,614 | 47,403 | | 1,970 | 50,614 | 49,373 |
| South Dakota | 2,208 | 3,961 | | | 2,208 | 3,961 |
| Tennessee | 24,312 | 50,325 | 21 | | 24,333 | 50,325 |
| Wisconson | 9,675 | 11,796 | 1 | | 9,676 | 11,796 |
| Total | 1,404,909 | 1,702,572 | 2,884 | 11,922 | 1,407,793 | 1,714,494 |
| District 3: | | | | | | |
| Alabama | 134,048 | 165,925 | 145 | 141 | 134,193 | 166,066 |
| Arkansas | 58,030 | 76,331 | | | 58,030 | 76,331 |
| Louisiana | 126,709 | 115,729 | 2 | | 126,711 | 115,729 |
| Mississippi | 37,575 | 39,102 | 2 | | 37,577 | 39,102 |
| New Mexico | 17,007 | 8,218 | | 190 | 17,007 | 8,408 |
| Texas | 246,720 | 227,669 | 71 | 1,503 | 246,791 | 229,172 |
| Total | 620,089 | 632,974 | 220 | 1,834 | 620,309 | 634,808 |
| District 4: | | | | | | |
| Colorado | 46,094 | 23,248 | | | 46,094 | 23,248 |
| Idaho | 3,525 | 3,344 | | | 3,525 | 3,344 |
| Montana | 4,879 | 5,622 | | | 4,879 | 5,622 |
| Utah | 17,850 | 15,717 | | | 17,850 | 15,717 |
| Wyoming | 2,034 | 1,200 | | | 2,034 | 1,200 |
| Total | 74,382 | 49,131 | | | 74,382 | 49,131 |
| District 5: | | | | | | |
| Alaska | 1,664 | 1,244 | | 12 | 1,664 | 1,256 |
| Arizona | 221 | 192 | | | 221 | 192 |
| California | 432,726 | 475,872 | 87 | 294 | 432,813 | 476,166 |
| Hawaii | 6,334 | 6,836 | 14 | | 6,348 | 6,836 |
| Nevada | 2,051 | 1,903 | | | 2,051 | 1,903 |
| Oregon | 101,678 | 100,008 | 31 | 31 | 101,709 | 100,039 |
| Washington | 40,654 | 37,690 | 27 | 158 | 40,681 | 37,848 |
| Total | 585,328 | 623,745 | 159 | 495 | 585,487 | 624,240 |
| Total United States | 3,817,824 | 4,379,309 | 3,457 | 14,406 | 3,821,281 | 4,393,715 |

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**TABLE 63.—Shipments of all other petroleum-asphalt products for consumption in the United States, by PAD districts and States**

(Short tons)

| District and State | Asphalt cements and fluxes | | Emulsified | | Total | |
|---|---|---|---|---|---|---|
| | 1963 | 1964 | 1963 | 1964 | 1963 | 1964 |
| District 1: | | | | | | |
| Connecticut | 26,554 | 13,122 | 424 | 547 | 26,978 | 13,669 |
| Delaware | 3,739 | 4,372 | 8 | ---------- | 3,747 | 4,372 |
| Florida | 70,956 | 73,279 | 568 | 525 | 71,524 | 73,804 |
| Georgia | 84,323 | 100,431 | 781 | 840 | 85,104 | 101,271 |
| Maine | 4,064 | 2,613 | 118 | 133 | 4,182 | 2,746 |
| Maryland and District of Columbia | 36,845 | 36,535 | 1,093 | 1,085 | 37,938 | 37,620 |
| Massachusetts | 54,576 | 60,286 | 1,374 | 1,590 | 55,950 | 61,876 |
| New Hampshire | 517 | 1,052 | 23 | 45 | 540 | 1,097 |
| New Jersey | 213,287 | 188,532 | 2,476 | 1,102 | 215,763 | 189,634 |
| New York | 36,410 | 26,944 | 2,136 | 2,150 | 38,546 | 29,094 |
| North Carolina | 55,862 | 37,100 | 5,243 | 1,200 | 61,105 | 38,300 |
| Pennsylvania | 112,722 | 106,984 | 5,142 | 5,955 | 117,864 | 112,939 |
| Rhode Island | 6,754 | 31,557 | 195 | 264 | 6,949 | 31,821 |
| South Carolina | 18,363 | 2,739 | 4,731 | 6,176 | 23,094 | 8,915 |
| Vermont | 1,235 | 325 | 20 | 16 | 1,255 | 341 |
| Virginia | 41,664 | 15,554 | 1,138 | 899 | 42,802 | 16,453 |
| West Virginia | 28,772 | 9,107 | 62 | ---------- | 28,834 | 9,107 |
| Total | 796,643 | 710,532 | 25,532 | 22,527 | 822,175 | 733,059 |
| District 2: | | | | | | |
| Illinois | 183,351 | 204,599 | 13,221 | 7,567 | 196,572 | 212,166 |
| Indiana | 80,963 | 78,624 | 441 | 35 | 81,404 | 78,659 |
| Iowa | 5,015 | 6,383 | 2,783 | 1,805 | 7,798 | 8,188 |
| Kansas | 14,270 | 14,680 | 68 | 9 | 14,338 | 14,689 |
| Kentucky | 1,141 | 2,410 | 1,665 | 1,258 | 2,806 | 3,668 |
| Michigan | 42,991 | 41,490 | 4,979 | 16,625 | 47,970 | 58,115 |
| Minnesota | 20,021 | 46,542 | 805 | 1,217 | 20,826 | 47,759 |
| Missouri | 58,516 | 97,094 | 2,484 | 2,722 | 61,000 | 99,816 |
| Nebraska | 2,518 | 2,372 | 23 | 59 | 2,541 | 2,431 |
| North Dakota | 613 | 616 | 21 | 2 | 634 | 618 |
| Ohio | 76,946 | 158,759 | 3,618 | 5,317 | 80,564 | 164,076 |
| Oklahoma | 20,054 | 20,647 | 2,030 | 21 | 22,084 | 20,668 |
| South Dakota | 452 | 1,260 | ---------- | 1 | 452 | 1,261 |
| Tennessee | 6,809 | 35,193 | 162 | 186 | 6,971 | 35,379 |
| Wisconsin | 29,923 | 25,503 | 881 | 869 | 30,804 | 26,372 |
| Total | 543,583 | 736,172 | 33,181 | 37,693 | 576,764 | 773,865 |
| District 3: | | | | | | |
| Alabama | 6,469 | 5,811 | 486 | 548 | 6,955 | 6,359 |
| Arkansas | 11,798 | 8,551 | 36 | 137 | 11,834 | 8,688 |
| Louisiana | 80,298 | 86,901 | 1,006 | 468 | 81,304 | 87,369 |
| Mississippi | 14,699 | 9,801 | 817 | 409 | 15,516 | 10,210 |
| New Mexico | 2,083 | 1,744 | 24 | 5 | 2,107 | 1,749 |
| Texas | 137,504 | 174,333 | 3,621 | 4,153 | 141,125 | 178,486 |
| Total | 252,851 | 287,141 | 5,990 | 5,720 | 258,841 | 292,861 |
| District 4: | | | | | | |
| Colorado | 5,515 | 40,769 | 37 | 1,211 | 5,552 | 41,980 |
| Idaho | 64 | 144 | 16 | 17 | 80 | 161 |
| Montana | 805 | 77 | 13 | 15 | 818 | 92 |
| Utah | 2,813 | 7 | 17 | 10 | 2,830 | 17 |
| Wyoming | 530 | 1,310 | 10 | ---------- | 540 | 1,310 |
| Total | 9,727 | 42,307 | 93 | 1,253 | 9,820 | 43,560 |
| District 5: | | | | | | |
| Alaska | 695 | 557 | 2 | ---------- | 697 | 557 |
| Arizona | 2,206 | 2,380 | 183 | 292 | 2,389 | 2,672 |
| California | 163,515 | 125,235 | 12,788 | 6,695 | 176,303 | 131,930 |
| Hawaii | 34 | 104 | 127 | 188 | 161 | 292 |
| Nevada | 500 | 1,381 | 88 | 51 | 588 | 1,432 |
| Oregon | 14,873 | 49,768 | 1,894 | 1,920 | 16,767 | 51,688 |
| Washington | 12,806 | 9,147 | 1,840 | 2,337 | 14,646 | 11,484 |
| Total | 194,629 | 188,572 | 16,922 | 11,483 | 211,551 | 200,055 |
| Total United States | 1,797,433 | 1,964,724 | 81,718 | 78,676 | 1,879,151 | 2,043,400 |

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**TABLE 64.—Shipments of petroleum-asphalt and road oil for consumption in the United States, by PAD districts and States**

(Short tons)

| District and State | Asphalt cements and fluxes | Emulsified asphalts | Cutback asphalts | Total 1964 | Total 1963 | Road oil | |
|---|---|---|---|---|---|---|---|
| | | | | | | 1964 | 1963 |
| District 1: | | | | | | | |
| Connecticut | 133,824 | 3,133 | 42,301 | 179,258 | 194,100 | ---------- | 4 |
| Delaware | 63,447 | 2,396 | 20,231 | 86,074 | 45,052 | 163 | 148 |
| Florida | 594,428 | 48,479 | 90,540 | 733,447 | 672,134 | 735 | 96 |
| Georgia | 667,751 | 39,819 | 88,997 | 796,567 | 878,694 | 23 | 1 |
| Maine | 81,391 | 18,178 | 64,105 | 163,674 | 142,069 | 452 | 116 |
| Maryland and District of Columbia | 398,192 | 55,832 | 109,519 | 563,543 | 519,373 | 612 | 202 |
| Massachusetts | 431,445 | 2,345 | 37,154 | 470,944 | 434,717 | 13 | 121 |
| New Hampshire | 69,279 | 194 | 48,846 | 118,319 | 95,293 | ---------- | ---------- |
| New Jersey | 909,448 | 24,355 | 113,990 | 1,047,793 | 1,032,997 | 1,310 | 2,417 |
| New York | 756,187 | 112,915 | 242,575 | 1,111,677 | 1,194,222 | 4,970 | 3,513 |
| North Carolina | 344,579 | 123,429 | 74,726 | 542,734 | 505,663 | 737 | 702 |
| Pennsylvania | 814,344 | 64,620 | 186,373 | 1,065,337 | 944,705 | 4,529 | 6,349 |
| Rhode Island | 149,596 | 503 | 48,408 | 198,507 | 141,673 | 1,443 | 422 |
| South Carolina | 231,086 | 64,478 | 21,203 | 316,767 | 351,688 | ---------- | ---------- |
| Vermont | 12,506 | 339 | 18,493 | 31,338 | 39,276 | 1 | ---------- |
| Virginia | 329,284 | 38,463 | 110,912 | 478,659 | 443,131 | ---------- | ---------- |
| West Virginia | 129,160 | 10,069 | 25,282 | 164,511 | 136,774 | 315 | 353 |
| Total 1964 | 6,115,947 | 609,547 | 1,343,655 | 8,069,149 | ---------- | 15,303 | ---------- |
| Total 1963 | 5,678,407 | 692,699 | 1,400,455 | ---------- | 7,771,561 | ---------- | 14,444 |
| District 2: | | | | | | | |
| Illinois | 1,341,017 | 49,316 | 147,427 | 1,537,760 | 1,164,039 | 218,553 | 201,638 |
| Indiana | 444,991 | 195,414 | 188,945 | 829,350 | 809,251 | 36,858 | 25,671 |
| Iowa | 283,069 | 82,072 | 76,940 | 442,081 | 406,673 | 26,977 | 34,052 |
| Kansas | 308,097 | 16,205 | 189,944 | 514,246 | 542,198 | 621 | 7,846 |
| Kentucky | 191,959 | 44,862 | 57,850 | 294,671 | 395,338 | 10,910 | 8,012 |
| Michigan | 270,245 | 73,553 | 42,491 | 386,289 | 472,747 | 14,774 | 26,185 |
| Minnesota | 430,691 | 29,818 | 209,694 | 670,203 | 637,913 | 21,285 | 28,489 |
| Missouri | 381,922 | 8,380 | 251,901 | 642,203 | 711,024 | 78,283 | 80,602 |
| Nebraska | 65,941 | 1,612 | 58,739 | 126,292 | 159,584 | 4,155 | 2,392 |
| North Dakota | 94,073 | 19,824 | 68,534 | 182,431 | 208,817 | 5,317 | 10,709 |
| Ohio | 840,897 | 174,035 | 295,010 | 1,309,942 | 1,254,817 | 18,745 | 17,523 |
| Oklahoma | 416,818 | 2,537 | 207,765 | 627,120 | 514,816 | 14,797 | 5,102 |
| South Dakota | 83,063 | 3,084 | 59,916 | 146,063 | 141,887 | 13,122 | 15,384 |
| Tennessee | 438,745 | 42,177 | 40,848 | 521,770 | 402,060 | ---------- | 84 |
| Wisconsin | 209,275 | 9,084 | 77,495 | 295,854 | 334,926 | 108,656 | 132,027 |
| Total 1964 | 5,800,803 | 751,973 | 1,973,499 | 8,526,275 | ---------- | 573,053 | ---------- |
| Total 1963 | 5,233,569 | 755,886 | 2,166,635 | ---------- | 8,156,090 | ---------- | 598,916 |
| District 3: | | | | | | | |
| Alabama | 362,685 | 64,360 | 82,957 | 510,002 | 476,811 | 3 | 10 |
| Arkansas | 149,505 | 32,671 | 53,519 | 235,695 | 218,551 | 548 | 118 |
| Louisiana | 345,488 | 37,000 | 20,667 | 403,155 | 431,904 | 1,428 | 1,309 |
| Mississippi | 162,433 | 33,792 | 54,443 | 250,668 | 260,967 | ---------- | ---------- |
| New Mexico | 139,383 | 5,047 | 51,548 | 195,978 | 184,764 | 5,660 | 11,079 |
| Texas | 752,164 | 31,391 | 122,112 | 905,667 | 1,357,779 | 7,590 | r 17,681 |
| Total 1964 | 1,911,658 | 204,261 | 385,246 | 2,501,165 | ---------- | 15,229 | ---------- |
| Total 1963 | 2,211,550 | 230,330 | 488,896 | ---------- | 2,930,776 | ---------- | r 30,197 |

See footnote at end of table.

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**TABLE 64.—Shipments of petroleum-asphalt and road oil for consumption in the United States, by PAD districts and States—Continued**

(Short tons)

| District and State | Asphalt cements and fluxes | Emulsified asphalts | Cutback asphalts | Total 1964 | Total 1963 | Road oil | |
|---|---|---|---|---|---|---|---|
| | | | | | | 1964 | 1963 |
| District 4: | | | | | | | |
| Colorado | 217,583 | 8,580 | 64,567 | 290,730 | 289,444 | 9,913 | 22,456 |
| Idaho | 41,368 | 2,739 | 39,050 | 83,157 | 94,643 | 22,322 | 21,853 |
| Montana | 164,418 | 7,296 | 48,621 | 220,335 | 165,403 | 41,968 | 6,785 |
| Utah | 113,196 | 10 | 32,151 | 145,357 | 138,974 | 11,924 | 12,825 |
| Wyoming | 99,501 | ---------- | 28,403 | 127,904 | 103,605 | 12,212 | 17,348 |
| Total 1964 | 636,066 | 18,625 | 212,792 | 867,483 | ---------- | 98,339 | ---------- |
| Total 1963 | 529,861 | 24,245 | 237,963 | ---------- | 792,069 | ---------- | 81,267 |
| District 5: | | | | | | | |
| Alaska | 14,456 | 3,110 | 6,297 | 23,863 | 17,119 | ---------- | ---------- |
| Arizona | 86,690 | 29,734 | 26,198 | 142,622 | 148,959 | 83,971 | r 73,547 |
| California | 1,925,670 | 141,305 | 96,378 | 2,163,353 | 2,007,822 | 324,949 | 273,873 |
| Hawaii | 37,914 | 2,521 | 1,769 | 42,204 | 32,613 | 1,801 | 58 |
| Nevada | 89,559 | 1,477 | 13,641 | 104,677 | 109,211 | 20,595 | 16,357 |
| Oregon | 382,930 | 32,005 | 47,917 | 462,852 | 365,110 | 5,762 | 7,336 |
| Washington | 209,013 | 14,145 | 80,967 | 304,125 | 316,491 | 299 | 2,514 |
| Total 1964 | 2,746,232 | 224,297 | 273,167 | 3,243,696 | ---------- | 437,377 | ---------- |
| Total 1963 | 2,449,553 | 217,038 | 330,734 | ---------- | 2,997,325 | ---------- | r 373,685 |
| Total United States (all uses) 1964 | 17,210,706 | 1,808,703 | 4,188,359 | 23,207,768 | ---------- | 1,139,301 | ---------- |
| Total United States (all uses) 1963 | 16,102,940 | 1,920,198 | 4,624,683 | ---------- | 22,647,821 | ---------- | r 1,098,509 |

r Revised.

## OTHER PRODUCTS

**Wax.**—The total demand for petroleum wax in 1964 was 5,330,000 barrels, a 1.3 percent increase. Domestic demand continued to decline but the exports were higher than in 1963. The average of posted prices on bulk lots of crude scale wax were unchanged from last year, but lower postings were reported for refined and overrefined wax.

**Coke.**—Domestic demand for petroleum coke increased 1.6 percent over 1963. Exports increased 26.0 percent, and total demand for the year increased 4.9 percent. Production increased from 16.1 million tons in 1963 to 16.9 million tons in 1964. About 41 percent of the total production is marketable. The balance was coke burned off catalytic cracking units and was utilized as refinery fuel. Coke with a low sulfur content is used in making electrodes required in the electrolytic production of aluminum.

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**TABLE 65.—Salient statistics on wax in the United States, by types, months, and districts**

(Thousand barrels) [1]

| Month and district | 1963 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production | | | | Imports (all types) | Exports (all types) | Stocks, end of period | | | | Domestic demand (all types) |
| | Microcrystalline | Fully refined | Other | Total | | | Microcrystalline | Fully refined | Other | Total | |
| By months: | | | | | | | | | | | |
| January | 83 | 164 | 132 | 379 | ------- | 37 | 243 | 397 | 392 | 1,032 | 330 |
| February | 45 | 199 | 142 | 386 | ------- | 121 | 236 | 375 | 393 | 1,004 | 293 |
| March | 50 | 241 | 129 | 420 | ------- | 143 | 214 | 340 | 364 | 918 | 363 |
| April | 51 | 263 | 123 | 437 | ------- | 150 | 195 | 346 | 340 | 881 | 324 |
| May | 77 | 242 | 121 | 440 | ------- | 146 | 195 | 332 | 332 | 859 | 316 |
| June | 70 | 237 | 166 | 473 | ------- | 124 | 194 | 364 | 353 | 911 | 297 |
| July | 65 | 222 | 117 | 404 | 3 | 118 | 182 | 364 | 339 | 885 | 315 |
| August | 87 | 227 | 147 | 461 | ------- | 130 | 188 | 361 | 359 | 908 | 308 |
| September | 57 | 217 | 173 | 447 | ------- | 132 | 177 | 363 | 363 | 903 | 320 |
| October | 83 | 245 | 115 | 443 | 1 | 132 | 184 | 353 | 340 | 877 | 338 |
| November | 58 | 208 | 118 | 384 | ------- | 118 | 166 | 372 | 322 | 860 | 283 |
| December | 93 | 206 | 153 | 452 | ------- | 104 | 191 | 390 | 305 | 886 | 322 |
| Total | 819 | 2,671 | 1,636 | 5,126 | 4 | 1,455 | 191 | 390 | 305 | 886 | 3,809 |
| By districts: | | | | | | | | | | | |
| East Coast | 211 | 1,101 | 350 | 1,662 | 4 | | 31 | 85 | 46 | 162 | |
| Appalachian No. 1 | 109 | 47 | 227 | 383 | | | 12 | 26 | 29 | 67 | |
| Appalachian No. 2 | ------- | 61 | 20 | 81 | | | ------- | 8 | ------- | 8 | |
| Indiana, Illinois, Kentucky, etc. | 15 | 197 | 132 | 344 | ------- | | 2 | 22 | 69 | 93 | |
| Minnesota, Wisconsin, etc. | ------- | ------- | ------- | ------- | | 1,324 | ------- | ------- | ------- | ------- | NA |
| Oklahoma, Kansas, etc. | 269 | 160 | 87 | 516 | | | 57 | 45 | 3 | 105 | |
| Texas Inland | 85 | ------- | ------- | 85 | | | 36 | ------- | ------- | 36 | |
| Texas Gulf Coast | 82 | 657 | 293 | 1,032 | | | 30 | 91 | 69 | 190 | |
| Louisiana Gulf Coast | 19 | 10 | 442 | 471 | ------- | | 5 | 2 | 51 | 58 | |
| Arkansas, Louisiana Inland, etc. | ------- | ------- | ------- | ------- | | | ------- | ------- | ------- | ------- | |
| New Mexico | ------- | ------- | ------- | ------- | | | ------- | ------- | ------- | ------- | |
| Rocky Mountain | 29 | 29 | 24 | 82 | ------- | | 18 | 8 | 38 | 64 | |
| West Coast | ------- | 409 | 61 | 470 | ------- | 131 | ------- | 103 | ------- | 103 | |
| Total | 819 | 2,671 | 1,636 | 5,126 | 4 | 1,455 | 191 | 390 | 305 | 886 | 3,809 |

See footnotes at end of table.

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**TABLE 65.—Salient statistics on wax in the United States, by types, months, and districts—Continued**

(Thousand barrels)[1]

| Month and district | 1964 p | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production | | | | Imports (all types) | Exports (all types) | Stocks, end of period | | | | Domestic demand (all types) |
| | Microcrystalline | Fully refined | Other | Total | | | Microcrystalline | Fully refined | Other | Total | |
| By months: | | | | | | | | | | | |
| January | 57 | 191 | 156 | 404 | ------- | 122 | 169 | 359 | 326 | 854 | 314 |
| February | 78 | 250 | 81 | 409 | ------- | 137 | 189 | 413 | 269 | 871 | 255 |
| March | 79 | 233 | 144 | 456 | ------- | 130 | 179 | 394 | 285 | 858 | 339 |
| April | 85 | 208 | 150 | 443 | ------- | 121 | 175 | 407 | 277 | 859 | 321 |
| May | 108 | 269 | 114 | 491 | ------- | 172 | 193 | 438 | 258 | 889 | 289 |
| June | 88 | 249 | 109 | 446 | ------- | 136 | 182 | 462 | 267 | 911 | 288 |
| July | 104 | 248 | 86 | 438 | ------- | 141 | 206 | 445 | 249 | 900 | 308 |
| August | 63 | 226 | 144 | 433 | ------- | 171 | 185 | 425 | 271 | 881 | 281 |
| September | 94 | 253 | 88 | 435 | ------- | 168 | 183 | 407 | 247 | 837 | 311 |
| October | 77 | 255 | 141 | 473 | ------- | 152 | 171 | 392 | 272 | 835 | 323 |
| November | 81 | 256 | 138 | 475 | ------- | 129 | 182 | 402 | 282 | 866 | 315 |
| December | 86 | 251 | 112 | 449 | ------- | 155 | 213 | 409 | 286 | 908 | 252 |
| Total | 1,000 | 2,889 | 1,463 | 5,352 | ------- | 1,734 | 213 | 409 | 286 | 908 | 3,596 |
| By districts: | | | | | | | | | | | |
| East Coast | 244 | 1,226 | 461 | 1,931 | ------- | | 25 | 82 | 40 | 147 | |
| Appalachian No. 1 | 159 | 43 | 243 | 445 | | | 39 | 35 | 19 | 93 | |
| Appalachian No. 2 | ------- | 55 | 36 | 91 | | | ------ | 5 | ------ | 5 | |
| Indiana, Illinois, Kentucky, etc | 14 | 197 | 147 | 358 | | | 2 | 15 | 80 | 97 | |
| Minnesota, Wisconsin, etc | ------- | ------- | ------- | ------- | | | ------- | ------- | ------- | ------- | |
| Oklahoma, Kansas, etc | 247 | 212 | 78 | 537 | | 1,579 | 31 | 35 | 8 | 74 | NA |
| Texas Inland | 95 | ------- | ------- | 95 | | | 56 | ------- | ------- | 56 | |
| Texas Gulf Coast | 136 | 500 | 359 | 995 | | | 28 | 67 | 99 | 194 | |
| Louisiana Gulf Coast | 74 | 255 | 51 | 380 | ------- | | 16 | 67 | 1 | 84 | |
| Arkansas, Louisiana Inland, etc | ------- | ------- | ------- | ------- | | | ------- | ------- | ------- | ------- | |
| New Mexico | ------- | ------- | ------- | ------- | | | ------- | ------- | ------- | ------- | |
| Rocky Mountain | 31 | 44 | 17 | 92 | ------- | | 16 | 8 | 39 | 63 | |
| West Coast | ------- | 357 | 71 | 428 | ------- | 155 | ------- | 95 | ------ | 95 | |
| Total | 1,000 | 2,889 | 1,463 | 5,352 | ------- | 1,734 | 213 | 409 | 286 | 908 | 3,596 |

p Preliminary. NA Not Available.
[1] Conversion factor: 280 pounds to the barrel.

**TABLE 66.—Average monthly refinery prices of 124°–126° white crude scale wax at Pennsylvania refineries, 1960–64**

(Cents per pound)

| Year | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Average for year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1960 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 | 6.23 | 6.13 | 6.24 |
| 1961 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 |
| 1962 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 |
| 1963 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 |
| 1964 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 | 6.13 |

Source: Platt's Oil Price Handbook.



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**TABLE 67.—Salient statistics of petroleum coke in the United States, by months and districts[1]**

(Thousand barrels unless otherwise stated)

| Month and district | 1963 | | | | | | | p 1964 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Production | | | Yield (percent) | Exports | Stocks, end of period | Domestic demand | Production | | | Yield (percent) | Exports | Stocks, end of period | Domestic demand |
| | Marketable | Catalyst | Total | | | | | Marketable | Catalyst | Total | | | | |
| By months: | | | | | | | | | | | | | | |
| January | 2,431 | 4,203 | 6,634 | 2.4 | 235 | 5,954 | 6,325 | 2,903 | 4,297 | 7,200 | 2.6 | 1,473 | 6,421 | 5,789 |
| February | 2,360 | 3,822 | 6,182 | 2.5 | 833 | 6,020 | 5,283 | 2,712 | 4,003 | 6,715 | 2.6 | 848 | 6,564 | 5,724 |
| March | 2,672 | 4,011 | 6,683 | 2.5 | 704 | 6,003 | 5,996 | 3,132 | 4,155 | 7,287 | 2.6 | 921 | 6,646 | 6,284 |
| April | 2,744 | 3,734 | 6,478 | 2.6 | 984 | 5,905 | 5,592 | 2,895 | 3,936 | 6,831 | 2.7 | 1,126 | 6,794 | 5,557 |
| May | 2,505 | 4,000 | 6,505 | 2.5 | 965 | 5,692 | 5,753 | 2,938 | 4,107 | 7,045 | 2.6 | 1,500 | 6,893 | 5,446 |
| June | 2,734 | 3,864 | 6,598 | 2.5 | 896 | 5,643 | 5,751 | 3,092 | 4,088 | 7,180 | 2.6 | 1,109 | 6,963 | 6,001 |
| July | 2,893 | 4,144 | 7,037 | 2.6 | 918 | 5,786 | 5,976 | 3,226 | 4,279 | 7,505 | 2.6 | 1,430 | 7,086 | 5,952 |
| August | 2,749 | 4,176 | 6,925 | 2.4 | 1,294 | 5,762 | 5,655 | 2,834 | 4,241 | 7,075 | 2.5 | 1,020 | 6,894 | 6,247 |
| September | 2,724 | 4,024 | 6,748 | 2.5 | 1,087 | 5,857 | 5,566 | 2,675 | 4,072 | 6,747 | 2.5 | 990 | 6,696 | 5,955 |
| October | 2,750 | 4,085 | 6,835 | 2.6 | 991 | 5,973 | 5,728 | 2,774 | 4,136 | 6,910 | 2.5 | 1,039 | 6,619 | 5,948 |
| November | 2,886 | 3,890 | 6,776 | 2.6 | 698 | 6,906 | 5,145 | 2,797 | 3,973 | 6,770 | 2.6 | 965 | 6,878 | 5,546 |
| December | 2,980 | 4,307 | 7,287 | 2.7 | 1,157 | 6,483 | 6,553 | 2,894 | 4,166 | 7,060 | 2.5 | 1,142 | 6,795 | 6,001 |
| Total | 32,428 | 48,260 | 80,688 | 2.6 | 10,762 | 6,483 | 69,323 | 34,872 | 49,453 | 84,325 | 2.6 | 13,563 | 6,795 | 70,450 |
| By districts: | | | | | | | | | | | | | | |
| East Coast | 5,755 | 7,713 | 13,468 | 2.9 | | 1,089 | | 6,168 | 8,150 | 14,318 | 3.2 | | 601 | |
| Appalachian No. 1 | | 148 | 148 | .4 | | | | | 226 | 226 | .6 | | | |
| Appalachian No. 2 | 51 | 517 | 568 | 1.5 | | | | 20 | 529 | 549 | 1.5 | | | |
| Indiana, Illinois, Kentucky, etc | 6,753 | 9,685 | 16,438 | 2.9 | | 1,013 | | 7,286 | 10,162 | 17,448 | 3.0 | | 1,478 | |
| Minnesota, Wisconsin, etc | 1,297 | 704 | 2,001 | 4.1 | | 251 | | 1,833 | 717 | 2,550 | 4.7 | | 586 | |
| Oklahoma, Kansas, etc | 3,574 | 4,186 | 7,760 | 2.9 | | 803 | | 3,337 | 4,312 | 7,649 | 2.8 | | 1,074 | |
| Texas Inland | 456 | 1,559 | 2,015 | 1.7 | 6,625 | | NA | 471 | 1,657 | 2,128 | 1.8 | 7,045 | 4 | NA |
| Texas Gulf Coast | 3,955 | 13,102 | 17,057 | 3.3 | | 18 | | 4,182 | 12,924 | 17,106 | 2.3 | | 43 | |
| Louisiana Gulf Coast | 1,817 | 4,565 | 6,382 | 2.2 | | 10 | | 2,129 | 5,070 | 7,199 | 2.3 | | 27 | |
| Arkansas, Louisiana Inland, etc | 1,317 | 770 | 2,087 | 4.7 | | 677 | | 1,288 | 822 | 2,110 | 4.6 | | 513 | |
| New Mexico | | 47 | 47 | .5 | | | | | 51 | 51 | .5 | | | |
| Rocky Mountain | 454 | 2,094 | 2,548 | 2.3 | | 1,308 | | 508 | 2,126 | 2,634 | 2.2 | | 1,301 | |
| West Coast | 6,999 | 3,170 | 10,169 | 2.2 | 4,137 | 1,314 | | 7,650 | 2,707 | 10,357 | 2.2 | 6,518 | 1,168 | |
| Total | 32,428 | 48,260 | 80,688 | 2.6 | 10,762 | 6,483 | 69,323 | 34,872 | 49,453 | 84,325 | 2.6 | 13,563 | 6,795 | 70,450 |

p Preliminary. NA Not available.
[1] Conversion factor: 5.0 barrels to the short ton.

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**Still gas.**—The production of still gas in 1964 was 832,286 million cubic feet (131,257,000 barrels). This does not include 7,698,000 barrels used for petrochemical feedstocks. Refiners used 830,415 million cubic feet as refinery fuel. The heating value of the gas in 1964 was 946 B.t.u. per cubic foot compared with 976 B.t.u. in 1963.

**TABLE 68.—Production of still gas in the United States, by districts**

| District | 1962 | | 1963 | | » 1964 | |
|---|---|---|---|---|---|---|
| | Million cubic feet | Equivalent in thousand barrels | Million cubic feet | Equivalent in thousand barrels | Million cubic feet | Equivalent in thousand barrels |
| East Coast | 92,733 | 15,922 | 101,737 | 17,128 | 104,110 | 17,132 |
| Appalachian No. 1 | 11,524 | 1,837 | 9,659 | 1,538 | 10,439 | 1,839 |
| Appalachian No. 2 | 12,450 | 1,829 | 12,844 | 1,833 | 13,112 | 1,816 |
| Indiana, Illinois, Kentucky, etc | 157,965 | 26,308 | 155,505 | 24,911 | 169,473 | 26,063 |
| Minnesota, Wisconsin, North Dakota, and South Dakota | 9,272 | 1,554 | 8,454 | 1,303 | 10,050 | 1,437 |
| Oklahoma, Kansas, etc | 67,163 | 10,831 | 69,463 | 11,255 | 70,434 | 11,116 |
| Texas Inland | 25,354 | 4,733 | 31,712 | 5,821 | 31,198 | 5,542 |
| Texas Gulf Coast | 176,709 | 26,118 | 186,844 | 26,120 | 196,107 | 27,526 |
| Louisiana Gulf Coast | 60,720 | 9,131 | 54,200 | 8,159 | 60,024 | 9,000 |
| Arkansas, Louisiana Inland, etc | 11,296 | 2,080 | 11,628 | 2,001 | 11,082 | 1,776 |
| New Mexico | 1,525 | 284 | 1,483 | 283 | 1,896 | 317 |
| Rocky Mountain | 20,609 | 4,047 | 20,193 | 3,658 | 21,338 | 3,785 |
| West Coast | 135,456 | 26,155 | 133,824 | 25,288 | 133,023 | 23,908 |
| Total | 782,776 | 130,829 | 797,546 | 129,598 | 832,286 | 131,257 |

» Preliminary.

**Petrochemical Feedstocks.**—With increasing volumes of refinery-produced petroleum products being used as feedstocks by the petrochemical industry, it became difficult to evaluate use patterns of the various products. For this reason, petroleum refiners were asked to report data for feedstocks separately beginning with the data for 1963. These feedstocks are being reported in four boiling-range categories (still gas, liquefied refinery gas, naphtha-400°, and other). This provides a measure of the volume of refinery output used in the manufacture of petrochemicals and eliminates chemical manufacture from the regular petroleum refining operations.

The demand for petrochemical feedstocks in 1964 was 104,789,000 barrels, of which 7.3 percent represented still gas; 45.0 percent, LRG; 23.5 percent, naphtha-400°; and 24.2 percent, other. The average yield of petrochemical feedstocks per barrel of crude oil processed in 1964 was 3.2 percent.

**Miscellaneous Oils.**—The total demand for miscellaneous finished products in 1964 was 16,686,000 barrels. Production for the year was 16,874,000 barrels, of which 80.5 percent was produced at petroleum refineries and 19.5 percent at natural-gas processing plants. Since 1963 petrochemical production and petrochemical feedstocks have been excluded from the data for miscellaneous oils.

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**TABLE 69.—Production of miscellaneous finished oils in the United States in 1964, by districts and classes**

(Thousand barrels)

| District | Absorption | Petrolatum | Specialty oils [1] | Petrochemicals | Other products | Total |
|---|---|---|---|---|---|---|
| East Coast | | | 721 | 363 | 344 | 1,428 |
| Appalachian No. 1 | | 113 | 53 | | 77 | 243 |
| Appalachian No. 2 | | | 45 | | 26 | 71 |
| Indiana, Illinois, Kentucky, etc. | | 46 | 347 | 534 | 401 | 1,328 |
| Minnesota, Wisconsin, North Dakota, and South Dakota | | | | 95 | | 95 |
| Oklahoma, Kansas, etc. | 52 | 406 | 561 | 834 | 234 | 2,087 |
| Texas Inland | 321 | | 49 | 1,547 | 207 | 2,124 |
| Texas Gulf | 75 | 568 | 167 | 2,332 | 429 | 3,571 |
| Louisiana Gulf | 1,250 | 33 | 5 | 105 | 13 | 1,406 |
| Arkansas, Louisiana Inland | 1,413 | | | 17 | | 1,430 |
| Rocky Mountain, New Mexico | 188 | | 3 | 8 | 126 | 325 |
| West Coast | 34 | 29 | 1,509 | 811 | 383 | 2,766 |
| Total | 3,333 | 1,195 | 3,460 | 6,646 | 2,240 | 16,874 |

[1] Specialty oils include: Hydraulic 3; insulating 142; medicinal 210; spray oils 446; rust preventatives 6; sand frac 54; and others 2,599.

**Unfinished Oils.**—Unfinished oils include all oils that will be cracked or further distilled. The rerun (net) of unfinished oils represents the import plus or minus the change in stocks.

Imports of unfinished oils are included with crude oil under the quota established by the Oil Import Administration. By regulation, unfinished imports are restricted to 10 percent of the crude oil and unfinished oils quota.

## INTERCOASTAL SHIPMENTS

A total of 671,359,000 barrels of crude petroleum and petroleum products was shipped in intercoastal trade in 1964, a decrease of 11.8 percent compared with 1963 figures.

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**TABLE 70.—Petroleum oils, crude and refined, shipped from gulf and west coasts to east coast ports and from the gulf coast to west coast ports, 1964, by months, and total for 1963**

(Thousand barrels)

| Item | 1964 | | | | | | | | | | | | | 1963 total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | March | April | May | June | July | August | September | October | November | December | Total | |
| Gulf coast to east coast:[1] | | | | | | | | | | | | | | |
| Crude oil | 11,949 | 10,584 | 12,005 | 8,870 | 9,823 | 10,177 | 9,610 | 11,114 | 12,081 | 12,727 | 12,087 | 12,405 | 133,432 | 161,443 |
| Gasoline | 17,528 | 16,609 | 20,474 | 17,898 | 20,994 | 19,062 | 17,852 | 18,945 | 17,175 | 16,908 | 18,201 | 14,691 | 216,337 | 245,508 |
| Kerosine | 5,528 | 4,622 | 4,217 | 3,103 | 3,113 | 3,046 | 3,094 | 3,710 | 2,718 | 3,865 | 3,433 | 3,144 | 43,593 | 52,444 |
| Distillate fuel oil | 22,375 | 20,051 | 18,308 | 14,822 | 15,168 | 13,261 | 13,165 | 12,316 | 11,660 | 14,390 | 14,442 | 16,235 | 186,193 | 216,545 |
| Residual fuel oil | 2,841 | 2,523 | 2,863 | 2,051 | 3,259 | 2,174 | 2,378 | 2,940 | 2,961 | 2,199 | 2,486 | 2,702 | 31,377 | 31,638 |
| Military jet fuel | 908 | 990 | 1,379 | 1,934 | 1,662 | 1,887 | 928 | 771 | 1,653 | 1,057 | 1,381 | 917 | 15,467 | 14,807 |
| Lubricating oil | 624 | 517 | 672 | 708 | 882 | 892 | 771 | 612 | 873 | 789 | 826 | 601 | 8,767 | 8,768 |
| Other products | 1,421 | 1,725 | 980 | 883 | 756 | 918 | 1,132 | 1,509 | 1,092 | 1,394 | 1,211 | 1,000 | 14,021 | 13,287 |
| Total | 63,174 | 57,621 | 60,898 | 50,269 | 55,657 | 51,417 | 48,930 | 51,917 | 50,213 | 53,329 | 54,067 | 51,695 | 649,187 | 744,440 |
| West coast to east coast: | | | | | | | | | | | | | | |
| Gasoline | | | | | | | | | 19 | | | | 19 | 465 |
| Distillate fuel oil | | 136 | | 119 | 114 | | | | 137 | 115 | 28 | 301 | 950 | 2,085 |
| Residual fuel oil | 278 | 818 | 1,243 | 695 | 848 | 1,322 | 568 | 266 | | 528 | 204 | 199 | 6,969 | 6,673 |
| Military jet fuel | | | | | | 11 | | | | | 15 | 14 | 40 | |
| Lubricating oil | 67 | 13 | 92 | 58 | 13 | 77 | 20 | 110 | 67 | 23 | 87 | 41 | 668 | 496 |
| Other products | 12 | 8 | 10 | 16 | 9 | 14 | | 4 | | | 7 | | 80 | 207 |
| Total | 357 | 975 | 1,345 | 888 | 984 | 1,424 | 588 | 380 | 223 | 666 | 341 | 555 | 8,726 | 9,926 |
| Gulf coast to west coast:[1] | | | | | | | | | | | | | | |
| Gasoline | 137 | 364 | 387 | 598 | 1,265 | 1,657 | 829 | 50 | 352 | 931 | 680 | 751 | 8,001 | 2,102 |
| Kerosine | | | | | | 32 | 59 | 88 | 272 | | 302 | 194 | 947 | |
| Distillate fuel oil | | | | | | | | 82 | | | | | 82 | 20 |
| Military jet fuel | 206 | | | 100 | 668 | 680 | 160 | 236 | 613 | 123 | | 75 | 2,861 | 3,897 |
| Lubricating oil | 91 | 185 | 52 | 134 | 218 | 39 | 203 | 93 | 25 | 66 | 117 | 93 | 1,316 | 979 |
| Other products | 34 | 34 | | | 13 | | 42 | 33 | 14 | 41 | 11 | 17 | 239 | 81 |
| Total | 468 | 583 | 439 | 832 | 2,164 | 2,408 | 1,293 | 582 | 1,276 | 1,161 | 1,110 | 1,130 | 13,446 | 7,079 |

Source prior to July 1964: Geological Survey, U.S. Department of the Interior.

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## FOREIGN TRADE

Foreign trade statistics reported in this section were compiled from two sources. The imports of crude oil and unfinished oils were obtained from the petroleum refining companies. Imports of the refined petroleum products and all export data were compiled from records of the U.S. Department of Commerce.

**Imports.**—Total imports of all oils increased 52,130,000 barrels in 1964 to 826,843,000 barrels. Total imports increased 6.7 percent, which is in line with the trend of recent years. Imports of crude oil increased 6.3 percent (25,983,000 barrels), residual fuel oil imports increased 8.5 percent (23,138,000 barrels), and imports of unfinished oils increased 2.8 percent (885,000 barrels). Gasoline, military jet fuel, and asphalt decreased 9.6 percent, 18.9 percent and 4.8 percent, respectively; whereas imports of other products increased as follows: Kerosine, 28.8 percent; distillate fuel oil, 29.2 percent; liquefied gases, 64.1 percent; and lubricants, 60.9 percent.

**Exports.**—In 1964, total exports of petroleum and petroleum products (73,768,000 barrels) were a little lower than the 1963 exports (75,914,000 barrels) but well above the 1962 total (61,431,000 barrels). The 1964 distillate fuel oil exports (5,434,000 barrels) were only a little more than one-third of those in 1963 (15,014,000 barrels), and exports of kerosine in 1964 (171,000 barrels) were only one-fourth of those in 1963 (672,000 barrels). Exports of crude oil and military jet fuel decreased 19.7 percent and 12.4 percent, respectively, and slightly smaller amounts of lubricants and miscellaneous refined products were exported in 1964.

There were appreciable gains in exports of the other refinery products, gasoline (13.7 percent), residual fuel oil (23.5 percent), wax (19.2 percent), coke (26.0 percent), asphalt (9.1 percent), and liquefied gases (16.7 percent).

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## TABLE 71.—Petroleum oils, crude and refined, imported into the United States, by months [1]

(Thousand barrels)

| Year and class | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| Crude petroleum | 41,043 | 30,898 | 36,070 | 32,593 | 34,484 | 31,872 | 38,214 | 36,666 | 34,898 | 31,362 | 34,241 | 30,319 | 412,660 |
| Refined products: | | | | | | | | | | | | | |
| Gasoline | 1,589 | 750 | 1,487 | 1,923 | 1,060 | 1,488 | 1,068 | 1,242 | 1,848 | 1,569 | 932 | 1,189 | 16,145 |
| Kerosine | 625 | 393 | 566 | 722 | 588 | 861 | 979 | 848 | 896 | 776 | 682 | 706 | 8,642 |
| Distillate fuel oil | 1,076 | 722 | 710 | 606 | 606 | 711 | 714 | 631 | 678 | 867 | 956 | 833 | 9,110 |
| Residual fuel oil | 34,803 | 28,711 | 23,903 | 24,663 | 19,019 | 15,281 | 18,132 | 16,922 | 16,010 | 22,951 | 20,749 | 31,609 | 272,753 |
| Military jet fuel | 2,034 | 405 | | 863 | 2,114 | 149 | 1,655 | 2,329 | 1,312 | 2,403 | 1,004 | 679 | 14,947 |
| Lubricants | | 2 | 3 | | 2 | 2 | 2 | 4 | 3 | 2 | 1 | 2 | 23 |
| Wax | | | | | | | 3 | | | 1 | | | 4 |
| Asphalt | 478 | 221 | 421 | 465 | 496 | 642 | 694 | 822 | 588 | 608 | 290 | 486 | 6,211 |
| Liquefied gases (including ethane) | 346 | 364 | 220 | 218 | 101 | 50 | 81 | 93 | 180 | 237 | 252 | 374 | 2,516 |
| Unfinished oils | 2,200 | 2,158 | 2,379 | 2,914 | 2,489 | 2,886 | 3,571 | 2,685 | 2,622 | 3,006 | 2,668 | 2,124 | 31,702 |
| Total refined | 43,151 | 33,726 | 29,689 | 32,374 | 26,475 | 22,070 | 26,899 | 25,576 | 24,137 | 32,420 | 27,534 | 38,002 | 362,053 |
| Total crude and refined | 84,194 | 64,624 | 65,759 | 64,967 | 60,959 | 53,942 | 65,113 | 62,242 | 59,035 | 63,782 | 61,775 | 68,321 | 774,713 |
| 1964: [p] | | | | | | | | | | | | | |
| Crude petroleum | 39,635 | 32,209 | 36,945 | 33,091 | 35,968 | 34,337 | 43,820 | 40,743 | 36,853 | 39,224 | 34,102 | 31,666 | 438,643 |
| Refined products: | | | | | | | | | | | | | |
| Gasoline | 1,040 | 1,069 | 1,492 | 1,430 | 1,557 | 1,218 | 918 | 1,099 | 1,344 | 1,165 | 908 | 1,386 | 14,626 |
| Kerosine | 675 | 666 | 782 | 779 | 896 | 1,033 | 1,230 | 1,091 | 997 | 1,121 | 838 | 1,021 | 11,129 |
| Distillate fuel oil | 1,581 | 1,069 | 875 | 787 | 723 | 1,035 | 627 | 856 | 912 | 840 | 574 | 1,893 | 11,772 |
| Residual fuel oil | 39,734 | 29,187 | 24,712 | 27,970 | 19,797 | 17,748 | 20,460 | 18,447 | 18,915 | 24,712 | 23,342 | 30,867 | 295,891 |
| Military jet fuel | 1,948 | 931 | 1,231 | 707 | 1,131 | 1,242 | 1,213 | 1,550 | 640 | 542 | 852 | 131 | 12,118 |
| Lubricants | 4 | 2 | 3 | 4 | 2 | 5 | 4 | 2 | 3 | 5 | 1 | 2 | 37 |
| Asphalt | 354 | 140 | 230 | 274 | 487 | 1,048 | 833 | 578 | 595 | 522 | 452 | 399 | 5,912 |
| Liquefied gases (including ethane) | 420 | 447 | 321 | 246 | 185 | 232 | 352 | 266 | 298 | 416 | 410 | 535 | 4,128 |
| Unfinished oils | 3,219 | 1,699 | 2,530 | 3,004 | 3,391 | 2,742 | 2,434 | 3,343 | 1,859 | 2,449 | 2,627 | 3,290 | 32,587 |
| Total refined | 48,975 | 35,210 | 32,176 | 35,201 | 28,169 | 26,303 | 28,071 | 27,232 | 25,563 | 31,772 | 30,004 | 39,524 | 388,200 |
| Total crude and refined | 88,610 | 67,419 | 69,121 | 68,292 | 64,137 | 60,690 | 71,891 | 67,975 | 62,416 | 70,996 | 64,106 | 71,190 | 826,843 |

[p] Preliminary.
[1] Imports of crude and unfinished oils reported to the Bureau of Mines; imports of refined products compiled from records of the U.S. Department of Commerce.

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## TABLE 72.—Crude oil and petroleum products imported into the United States, 1963–64, by countries and receiving districts

(Thousand barrels)

| Country | Crude oil [1] | Gasoline | Kerosine [2] [3] | Distillate fuel oil [3] | Residual fuel oil [3] | Military jet fuel | Liquefied gases | Asphalt | Unfinished oils [1] | Lubricants | Wax | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | |
| North America: | | | | | | | | | | | | |
| Canada | 90,394 | 576 | 4 | 179 | 1,727 | | 2,259 | 77 | 1,504 | 16 | 1 | 96,737 |
| Canal Zone | | | | | 26 | | | | | | | 26 |
| Mexico | 3,657 | | | 7 | 6,781 | | | | 6,926 | | | 17,371 |
| Netherlands Antilles | | 3,716 | 3,633 | 3,308 | 88,854 | 6,408 | | 2,949 | 3,733 | | | 112,601 |
| Panama | | 257 | | | 3,300 | | | | | | | 3,557 |
| Puerto Rico | | 8,521 | 19 | 2,276 | 5,156 | | | | | | | 15,972 |
| Trinidad and Tobago | | 386 | 1,594 | 83 | 33,429 | 2,892 | | 28 | 2,121 | | | 40,533 |
| Total | 94,051 | 13,456 | 5,250 | 5,853 | 139,273 | 9,300 | 2,259 | 3,054 | 14,284 | 16 | 1 | 286,797 |
| South America: | | | | | | | | | | | | |
| Argentina | | | | | 2,411 | | | | | | | 2,411 |
| Brazil | 2,052 | | | | 108 | | | | | | | 2,160 |
| Colombia | 8,293 | | | | 605 | | | | | | | 8,898 |
| Ecuador | | | | | 1 | | | | | | | 1 |
| Venezuela | 174,537 | 2,580 | 3,258 | 3,209 | 127,017 | 5,430 | 195 | 3,112 | 9,193 | | | 328,531 |
| Total | 184,882 | 2,580 | 3,258 | 3,209 | 130,142 | 5,430 | 195 | 3,112 | 9,193 | | | 342,001 |
| Europe: | | | | | | | | | | | | |
| France | | | 58 | | | 198 | | | | | | 256 |
| Germany, West | | | | | | | 1 | | | | 3 | 4 |
| Italy | | | 76 | | | | | | 232 | | | 308 |
| Netherlands | | | | | 14 | | | 45 | 346 | 4 | | 409 |
| Spain | | | | 4 | 178 | 19 | | | | | | 201 |
| Sweden | | | | | | | | | | 2 | | 2 |
| United Kingdom | | 10 | | | 205 | | 29 | | 896 | 1 | | 1,141 |
| Total | | 10 | 134 | 4 | 397 | 217 | 30 | 45 | 1,474 | 7 | 3 | 2,321 |
| Asia: | | | | | | | | | | | | |
| Bahrain | | 99 | | | 1,109 | | | | | | | 1,208 |
| Iran | 22,717 | | | | | | | | 80 | | | 22,797 |
| Iraq | 321 | | | | | | | | | | | 321 |
| Japan | | | | | | | | | 508 | | | 508 |
| Kuwait | 29,680 | | | | | | | | 2,953 | | | 32,633 |
| Kuwait-Saudi Arabia, neutral zone | 15,855 | | | | | | | | 328 | | | 16,183 |
| Qatar | 5,835 | | | | | | | | 289 | | | 6,124 |
| Saudi Arabia | 28,806 | | | 44 | 1,832 | | 32 | | 786 | | | 31,500 |

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| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Singapore | | | | | | | | | 171 | | | 171 |
| Sumatra | 21,340 | | | | | | | | 1,636 | | | 22,976 |
| Total | 124,554 | 99 | | 44 | 2,941 | | 32 | | 6,751 | | | 134,421 |
| Africa: | | | | | | | | | | | | |
| Algeria | 380 | | | | | | | | | | | 380 |
| Libya | 7,021 | | | | | | | | | | | 7,021 |
| United Arab Republic (Egypt) | 1,772 | | | | | | | | | | | 1,772 |
| Total | 9,173 | | | | | | | | | | | 9,173 |
| Total imports | 412,660 | 16,145 | 8,642 | 9,110 | 272,753 | 14,947 | 2,516 | 6,211 | 31,702 | 23 | 4 | 774,713 |
| Imports by PAD Districts: | | | | | | | | | | | | |
| District 1 | 248,199 | 14,537 | 5,787 | 7,787 | 252,785 | 13,308 | 401 | 4,907 | 21,779 | 14 | 4 | 569,508 |
| District 2 | 34,666 | 151 | | 63 | 800 | | 1,097 | 76 | 476 | 6 | | 37,335 |
| District 3 | 1,698 | 125 | 20 | 1,250 | 12,327 | | | 1,228 | 2,102 | 2 | | 18,752 |
| District 4 | 3,528 | 1 | | 1 | 26 | | 10 | | | 1 | | 3,567 |
| District 5 | 124,569 | 1,331 | 2,835 | 9 | 6,815 | 1,639 | 1,008 | | 7,345 | | | 145,551 |
| 1964: p | | | | | | | | | | | | |
| North America: | | | | | | | | | | | | |
| Canada | 101,607 | 515 | | 110 | 1,826 | | 3,952 | 149 | 1,143 | 28 | | 109,330 |
| Canal Zone | | | | | 349 | | | | | | | 349 |
| Mexico | 3,577 | | | | 6,684 | | | | 6,973 | | | 17,234 |
| Netherlands Antilles | | 3,313 | 6,012 | 4,224 | 95,182 | 7,585 | | 3,350 | 2,241 | | | 121,907 |
| Panama | | 142 | | | 1,541 | | | | | | | 1,683 |
| Puerto Rico | | 8,395 | | 3,891 | 4,787 | | | | | | | 17,073 |
| Trinidad and Tobago | | 1,030 | 1,488 | 32 | 36,527 | | | 23 | 3,457 | | | 42,557 |
| Total | 105,184 | 13,395 | 7,500 | 8,257 | 146,896 | 7,585 | 3,952 | 3,522 | 13,814 | 28 | | 310,133 |
| South America: | | | | | | | | | | | | |
| Argentina | | | | | 1,290 | | | | | | | 1,290 |
| Brazil | | | | | 246 | | | | | | | 246 |
| Colombia | 9,606 | | | | 1,485 | | | | | | | 11,091 |
| Venezuela | 174,222 | 862 | 3,629 | 3,515 | 142,256 | 4,533 | 174 | 2,356 | 10,188 | | | 341,735 |
| Total | 183,828 | 862 | 3,629 | 3,515 | 145,277 | 4,533 | 174 | 2,356 | 10,188 | | | 354,362 |
| Europe: | | | | | | | | | | | | |
| Germany, West | | | | | | | | | 161 | | | 161 |
| Italy | | | | | 12 | | | | 625 | | | 637 |
| Netherlands | | 289 | | | 117 | | | 34 | | 9 | | 449 |
| United Kingdom | | | | | | | | | 149 | | | 149 |
| Total | | 289 | | | 129 | | | 34 | 935 | 9 | | 1,396 |

See footnotes at end of table.

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**TABLE 72.—Crude oil and petroleum products imported into the United States, 1963–64, by countries and receiving districts—Continued**

(Thousand barrels)

| Country | Crude oil [1] | Gasoline | Kerosine [2 3] | Distillate fuel oil [3] | Residual fuel oil [3] | Military jet fuel | Liquefied gases | Asphalt | Unfinished oils [1] | Lubricants | Wax | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1964: p—Continued | | | | | | | | | | | | |
| Asia: | | | | | | | | | | | | |
| Abu Dhabi | 1,112 | | | | | | | | | | | 1,112 |
| Aden | | | | | 1 | | | | | | | 1 |
| Bahrain | | | | | 1,048 | | | | 336 | | | 1,384 |
| India | | | | | | | 1 | | 154 | | | 155 |
| Iran | 24,143 | | | | | | | | 107 | | | 24,250 |
| Japan | | | | | | | 1 | | 386 | | | 387 |
| Kuwait | 23,263 | | | | | | | | 2,150 | | | 25,413 |
| Kuwait-Saudi Arabia (neutral zone) | 17,565 | | | | | | | | 114 | | | 17,679 |
| Leeward and Windward Isle | | | | | 1 | | | | | | | 1 |
| Qatar | 7,294 | | | | | | | | 116 | | | 7,410 |
| Saudi Arabia | 35,464 | 80 | | | 2,538 | | | | 1,033 | | | 39,115 |
| Singapore | | | | | | | | | 531 | | | 531 |
| Sumatra | 23,047 | | | | | | | | 1,708 | | | 24,755 |
| Total | 131,888 | 80 | | | 3,588 | | 2 | | 6,635 | | | 142,193 |
| Africa: | | | | | | | | | | | | |
| Algeria | 2,249 | | | | | | | | | | | 2,249 |
| French Somaliland | | | | | 1 | | | | | | | 1 |
| Libya | 14,417 | | | | | | | | | | | 14,417 |
| United Arab Republic (Egypt) | 1,077 | | | | | | | | 1,015 | | | 2,092 |
| Total | 17,743 | | | | 1 | | | | 1,015 | | | 18,759 |
| Total imports | 438,643 | 14,626 | 11,129 | 11,772 | 295,891 | 12,118 | 4,128 | 5,912 | 32,587 | 37 | | 826,843 |
| Imports by PAD districts: | | | | | | | | | | | | |
| District 1 | 252,527 | 12,796 | 7,785 | 10,546 | 274,426 | 10,804 | 308 | 5,405 | 21,151 | 31 | | 595,779 |
| District 2 | 37,801 | 24 | | 64 | 804 | | 2,509 | 148 | 478 | 3 | | 41,831 |
| District 3 | 1,835 | 435 | | 1,119 | 11,204 | | 2 | 359 | 1,011 | | | 15,965 |
| District 4 | 4,409 | 1 | | | 45 | | 112 | | | 1 | | 4,568 |
| District 5 | 142,071 | 1,370 | 3,344 | 43 | 9,412 | 1,314 | 1,197 | | 9,947 | 2 | | 168,700 |

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[1] Imports of crude oil and unfinished oils reported to the Bureau of Mines, imports of refined products compiled from records of the U.S. Department of Commerce.

[2] Includes commercial jet fuel.

[3] Includes quantities imported duty free for supply of vessels and aircraft engaged in foreign trade.

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**TABLE 73.—Petroleum oils, crude and refined, exported from the United States, including shipments to territories and possessions, by months [1]**

(Thousand barrels)

| Year and class | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963: | | | | | | | | | | | | | |
| Crude petroleum | 179 | 116 | 95 | 170 | 140 | 123 | 146 | 178 | 100 | 179 | 106 | 166 | 1,698 |
| Refined products: | | | | | | | | | | | | | |
| Gasoline [2] | 409 | 750 | 447 | 637 | 237 | 557 | 439 | 559 | 663 | 764 | 674 | 850 | 6,986 |
| Kerosine | 103 | 173 | 50 | 22 | 187 | 7 | 21 | 32 | 12 | 16 | 26 | 23 | 672 |
| Distillate fuel oil | 1,104 | 3,002 | 1,125 | 1,238 | 1,175 | 997 | 995 | 1,129 | 1,371 | 985 | 1,431 | 462 | 15,014 |
| Residual fuel oil | 814 | 1,477 | 1,060 | 1,315 | 1,338 | 967 | 1,123 | 1,358 | 1,719 | 959 | 1,829 | 1,322 | 15,281 |
| Military jet fuel | 13 | 20 | 9 | 33 | 10 | 10 | 9 | 12 | 11 | 13 | 39 | 15 | 194 |
| Lubricants | 1,124 | 1,345 | 1,402 | 1,858 | 1,810 | 1,308 | 1,771 | 1,463 | 1,567 | 1,482 | 1,391 | 1,796 | 18,317 |
| Wax | 37 | 121 | 143 | 150 | 146 | 124 | 118 | 130 | 132 | 132 | 118 | 104 | 1,455 |
| Coke | 235 | 833 | 704 | 984 | 965 | 896 | 918 | 1,294 | 1,087 | 991 | 698 | 1,157 | 10,762 |
| Asphalt | 6 | 47 | 44 | 37 | 58 | 31 | 40 | 71 | 46 | 99 | 57 | 167 | 703 |
| Liquefied gases (including ethane) | 362 | 388 | 428 | 358 | 362 | 369 | 396 | 378 | 390 | 379 | 364 | 419 | 4,593 |
| Miscellaneous | 3 | 27 | 30 | 26 | 23 | 16 | 20 | 19 | 18 | 22 | 18 | 17 | 239 |
| Total refined | 4,210 | 8,183 | 5,442 | 6,658 | 6,311 | 5,282 | 5,850 | 6,445 | 7,016 | 5,842 | 6,645 | 6,332 | 74,216 |
| Total crude and refined | 4,389 | 8,299 | 5,537 | 6,828 | 6,451 | 5,405 | 5,996 | 6,623 | 7,116 | 6,021 | 6,751 | 6,498 | 75,914 |
| 1964: [p] | | | | | | | | | | | | | |
| Crude petroleum | 116 | 98 | 233 | 100 | 174 | 152 | 90 | 118 | 71 | 88 | ---------- | 123 | 1,363 |
| Refined products: | | | | | | | | | | | | | |
| Gasoline [2] | 586 | 373 | 787 | 375 | 549 | 684 | 997 | 822 | 529 | 728 | 664 | 848 | 7,942 |
| Kerosine | 7 | 26 | 11 | 12 | 21 | 5 | 22 | 10 | 11 | 10 | 19 | 17 | 171 |
| Distillate fuel oil | 1,222 | 442 | 616 | 264 | 311 | 310 | 364 | 196 | 576 | 508 | 253 | 372 | 5,434 |
| Residual fuel oil | 1,561 | 1,023 | 1,668 | 2,000 | 1,375 | 1,942 | 1,498 | 1,547 | 1,517 | 1,879 | 1,321 | 1,539 | 18,870 |
| Military jet fuel | 36 | 13 | 14 | 14 | 11 | 11 | 12 | 9 | 12 | 9 | 13 | 16 | 170 |
| Lubricants | 1,202 | 1,436 | 1,366 | 1,980 | 1,276 | 1,637 | 1,650 | 1,691 | 1,246 | 1,659 | 1,479 | 1,538 | 18,160 |
| Wax | 122 | 137 | 130 | 121 | 172 | 136 | 141 | 171 | 168 | 152 | 129 | 155 | 1,734 |
| Coke | 1,473 | 848 | 921 | 1,126 | 1,500 | 1,109 | 1,430 | 1,020 | 990 | 1,039 | 965 | 1,142 | 13,563 |
| Asphalt | 52 | 47 | 43 | 77 | 41 | 93 | 60 | 54 | 107 | 54 | 81 | 58 | 767 |
| Liquefied gases (including ethane) | 404 | 386 | 433 | 410 | 437 | 498 | 475 | 485 | 413 | 426 | 462 | 529 | 5,358 |
| Miscellaneous | 12 | 22 | 23 | 21 | 18 | 17 | 20 | 21 | 23 | 21 | 17 | 21 | 236 |
| Total refined | 6,677 | 4,753 | 6,012 | 6,400 | 5,711 | 6,442 | 6,669 | 6,026 | 5,592 | 6,485 | 5,403 | 6,235 | 72,405 |
| Total crude and refined | 6,793 | 4,851 | 6,245 | 6,500 | 5,885 | 6,594 | 6,759 | 6,144 | 5,663 | 6,573 | 5,403 | 6,358 | 73,768 |

[p] Preliminary.
[1] Compiled from records of U.S. Department of Commerce.
[2] Includes benzol, naphtha, natural gasoline, and antiknock compounds.

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**TABLE 74.—Crude petroleum and petroleum products exported from the United States by countries of destination and shipments to and exports from territories and possessions**

(Thousand barrels)

| Country | Crude petroleum | Gasoline [1] | Kerosine | Distillate oil | Residual oil | Lubricating oil | Asphalt | Liquefied petroleum gases | Wax | Coke | Petrolatum | Miscellaneous products | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1963 | | | | | | | | | | | | | |
| North America: | | | | | | | | | | | | | |
| Canada | 2 | 897 | 83 | 540 | 3,357 | 1,327 | 127 | 151 | 139 | 1,300 | 18 | 46 | 7,987 |
| El Salvador | | 9 | | | | 29 | 11 | (2) | 10 | | 1 | 2 | 22 |
| Mexico | 3 | 312 | (2) | 215 | 1,554 | 99 | 63 | 4,232 | 183 | 61 | 16 | 154 | 6,892 |
| Netherlands Antilles | | 2,526 | | | | 16 | (2) | (2) | | | (2) | (2) | 2,542 |
| Other | | 113 | 3 | 121 | 29 | 405 | 30 | 70 | 82 | | 6 | 18 | 877 |
| Total | 5 | 3,857 | 86 | 876 | 4,940 | 1,876 | 231 | 4,453 | 414 | 1,361 | 41 | 220 | 18,360 |
| South America: | | | | | | | | | | | | | |
| Argentina | | 1 | | | | 198 | 3 | (2) | 1 | | (2) | (2) | 203 |
| Brazil | | 9 | 17 | 4 | | 1,200 | (2) | 4 | 42 | 49 | 9 | 1 | 1,335 |
| Chile | | 1 | 1 | | | 185 | 49 | | 44 | | 1 | 7 | 288 |
| Colombia | | 16 | (2) | | (2) | 192 | (2) | (2) | 100 | (2) | 5 | 6 | 319 |
| Peru | | 1 | | 1 | 205 | 144 | (2) | (2) | 28 | | 2 | 9 | 390 |
| Venezuela | | 196 | 1 | | | 47 | 6 | (2) | 42 | (2) | 3 | 1 | 296 |
| Other | | 4 | (2) | (2) | 14 | 127 | 4 | 2 | 44 | | 2 | 8 | 205 |
| Total | | 228 | 19 | 5 | 219 | 2,093 | 62 | 6 | 301 | 49 | 22 | 32 | 3,036 |
| Europe: | | | | | | | | | | | | | |
| Belgium-Luxembourg | 1 | 1 | 1 | 2,176 | | 876 | 8 | 1 | 14 | 101 | 3 | 9 | 3,191 |
| Denmark | | (2) | | 359 | | 206 | (2) | 8 | 15 | (2) | (2) | 3 | 591 |
| France | | 10 | (2) | 637 | 359 | 113 | 4 | 50 | 54 | 368 | 4 | 2 | 1,601 |
| Germany, West | | 98 | 17 | 692 | 583 | 474 | 2 | 34 | 135 | 708 | 9 | 4 | 2,756 |
| Greece | | 181 | | | | 116 | (2) | (2) | 1 | | (2) | 3 | 301 |
| Italy | (2) | 474 | 1 | | 499 | 802 | 4 | 10 | 61 | 1,111 | 5 | 8 | 2,975 |
| Netherlands | | 107 | 6 | r 1,442 | 438 | 408 | 3 | 5 | 69 | 2,129 | 3 | 8 | r 4,618 |
| Norway | | (2) | | | | 48 | (2) | (2) | 4 | 681 | 1 | 3 | 737 |
| Sweden | | 1 | (2) | 1,276 | | 466 | 2 | (2) | 14 | 49 | 1 | 12 | 1,821 |
| United Kingdom | 424 | 102 | 221 | 386 | 1,302 | 1,253 | 1 | 4 | 79 | 78 | 16 | 1 | 3,867 |
| Other | | 10 | 3 | (2) | | 656 | 9 | 1 | 62 | 585 | 8 | 9 | 1,343 |
| Total | 425 | 984 | 249 | r 6,968 | 3,181 | 5,418 | 33 | 113 | 508 | 5,810 | 50 | 62 | r 23,801 |

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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Asia: | | | | | | | | | | | | | |
| India | | 17 | (2) | 11 | 1 | 1,829 | 5 | (2) | 3 | 60 | 12 | 8 | 1,946 |
| Indonesia | | 17 | (2) | 22 | | 133 | 1 | | 5 | | 20 | 1 | 199 |
| Japan | 1,266 | 211 | 6 | 8,687 | 5,914 | 1,907 | 8 | 4 | 32 | 3,263 | 27 | 21 | 21,346 |
| Malaysia | | 39 | | | | 179 | (2) | | 1 | | 3 | 4 | 226 |
| Philippines | | 17 | 1 | | | 367 | 16 | 1 | 16 | | 13 | 22 | 453 |
| Turkey | | 114 | 2 | | | 492 | (2) | | 1 | | (2) | 27 | 636 |
| Other | 1 | 80 | 1 | 1 | (2) | 1,300 | 55 | 1 | 69 | 46 | 14 | 50 | 1,618 |
| Total | 1,267 | 495 | 10 | 8,721 | 5,915 | 6,207 | 85 | 6 | 127 | 3,369 | 89 | 133 | 26,424 |
| Africa: | | | | | | | | | | | | | |
| Congo (Leopoldville) | | 480 | 95 | 182 | | 240 | 13 | | 1 | | 2 | 40 | 1,053 |
| South Africa, Republic of | | 18 | 2 | | 88 | 367 | 206 | 1 | 46 | (2) | 17 | 16 | 761 |
| United Arab Republic (Egypt) | | 9 | 4 | | | 318 | (2) | | (2) | | 1 | 10 | 342 |
| Other | | 10 | 6 | (2) | 526 | 310 | 16 | 1 | 13 | | 8 | 20 | 910 |
| Total | | 517 | 107 | 182 | 614 | 1,235 | 235 | 2 | 60 | (2) | 28 | 86 | 3,066 |
| Oceania: | | | | | | | | | | | | | |
| Australia | | 120 | 15 | 4 | 385 | 885 | 7 | 2 | 34 | 174 | 7 | 5 | 1,638 |
| French Pacific Islands | | 67 | 22 | 177 | 26 | 4 | 2 | 10 | (2) | | | (2) | 308 |
| New Zealand | | 93 | 4 | | | 87 | (2) | 3 | 11 | | 3 | 28 | 229 |
| Other | | 57 | 1 | 1 | 1 | 1 | 1 | 2 | | | | (2) | 64 |
| Total | | 337 | 42 | 182 | 412 | 977 | 10 | 17 | 45 | 174 | 10 | 33 | 2,239 |
| Grand total | 1,697 | 6,418 | 513 | r 16,934 | 15,281 | r 17,806 | 656 | 4,597 | 1,455 | 10,763 | 240 | 566 | r 76,926 |
| Shipments from the United States to territories and possessions: | | | | | | | | | | | | | |
| Puerto Rico | | 6 | 145 | | (3) | 116 | 38 | (3) | (3) | (3) | (3) | 6 | 311 |
| Virgin Islands | | 63 | 9 | 60 | (3) | 7 | 2 | (3) | (3) | (3) | (3) | (2) | 141 |
| Wake | | 449 | | 44 | (3) | (2) | 3 | (3) | (3) | (3) | (3) | (2) | 496 |
| Other | | 57 | 5 | 180 | (3) | 7 | 5 | (3) | (3) | (3) | (3) | (2) | 254 |
| Total | | 575 | 159 | 284 | (3) | 130 | 48 | (3) | (3) | (3) | (3) | 6 | 1,202 |
| Exports from territories to foreign countries: | | | | | | | | | | | | | |
| Puerto Rico | | 1 | | 2,077 | (3) | (3) | (3) | 4 | | | | | 2,082 |
| Total net shipments from the United States | 1,697 | 6,992 | 672 | r 15,141 | 15,281 | r 17,936 | 704 | 4,593 | 1,455 | 10,763 | 240 | 572 | r 76,046 |

**See footnotes at end of table.**

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**TABLE 74.—Crude petroleum and petroleum products exported from the United States by countries of destination and shipments to and exports from territories and possessions—Continued**

(Thousand barrels)

| Country | Crude petroleum | Gasoline [1] | Kerosine | Distillate oil | Residual oil | Lubricating oil | Asphalt | Liquefied petroleum gases | Wax | Coke | Petrolatum | Miscellaneous products | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1964 | | | | | | | | | | | | | |
| North America: | | | | | | | | | | | | | |
| Canada | 7 | 837 | 14 | 619 | 4,628 | 1,495 | 75 | 117 | 146 | 1,800 | 18 | 42 | 9,798 |
| El Salvador | | 15 | | | | 27 | (2) | | 9 | | 1 | 2 | 54 |
| Mexico | 3 | 336 | 2 | 479 | 2,429 | 124 | 102 | 5,027 | 169 | 66 | 12 | 174 | 8,923 |
| Netherlands Antilles | (2) | 3,484 | | | | 15 | (2) | (2) | (2) | | (2) | (2) | 3,499 |
| Other | | 119 | 1 | 158 | 9 | 437 | 44 | 55 | 100 | | 8 | 19 | 950 |
| Total | 10 | 4,791 | 17 | 1,256 | 7,066 | 2,098 | 221 | 5,199 | 424 | 1,866 | 39 | 237 | 23,224 |
| South America: | | | | | | | | | | | | | |
| Argentina | | 2 | | | | 449 | 4 | 25 | 1 | | (2) | 1 | 482 |
| Brazil | | 13 | 16 | | | 1,244 | 1 | 10 | 30 | 59 | 11 | (2) | 1,384 |
| Chile | | 2 | 1 | 1 | | 212 | 45 | | 52 | | 1 | 8 | 322 |
| Colombia | | 14 | (2) | 5 | | 95 | 1 | (2) | 82 | | 3 | 9 | 209 |
| Peru | | 1 | | | 397 | 164 | 1 | | 34 | 2 | 1 | 9 | 609 |
| Venezuela | | 168 | (2) | | | 45 | 8 | (2) | 69 | 118 | 3 | 1 | 412 |
| Other | | 3 | (2) | | 14 | 151 | 8 | 1 | 50 | | 2 | 9 | 238 |
| Total | | 203 | 17 | 6 | 411 | 2,360 | 68 | 36 | 318 | 179 | 21 | 37 | 3,656 |
| Europe: | | | | | | | | | | | | | |
| Belgium-Luxembourg | (2) | 9 | 1 | 116 | | 877 | 7 | 1 | 15 | 248 | 3 | 12 | 1,289 |
| Denmark | | (2) | | | | 174 | (2) | (2) | 19 | 30 | 1 | 3 | 227 |
| France | | 38 | 1 | 3 | 437 | 92 | 3 | 10 | 57 | 944 | 2 | 1 | 1,588 |
| Germany, West | | 192 | 27 | | | 513 | 1 | 59 | 178 | 1,034 | 9 | 4 | 2,017 |
| Greece | | 168 | | | 1 | 105 | (2) | 1 | 1 | | (2) | 2 | 278 |
| Italy | | 434 | 1 | 4 | 782 | 490 | 3 | 1 | 106 | 1,031 | 4 | 6 | 2,862 |
| Netherlands | (2) | 320 | 6 | 373 | 590 | 463 | 2 | 2 | 95 | 1,498 | 4 | 10 | 3,369 |
| Norway | | (2) | | | | 27 | (2) | (2) | 2 | 652 | 1 | 4 | 686 |
| Sweden | | 1 | | 634 | | 406 | 2 | (2) | 15 | 101 | 1 | 12 | 1,172 |
| United Kingdom | 336 | 321 | 39 | | 1,228 | 1,209 | 55 | 10 | 76 | 239 | 13 | 1 | 3,527 |
| Other | | 81 | (2) | 6 | (2) | 428 | 8 | 3 | 103 | 299 | 11 | 10 | 899 |
| Total | 336 | 1,520 | 75 | 1,136 | 3,038 | 4,784 | 81 | 87 | 667 | 6,076 | 49 | 65 | 17,914 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Asia:** | | | | | | | | | | | | | |
| India | | 2 | 1 | 10 | 6 | 1,604 | 4 | (2) | 3 | 100 | 25 | 11 | 1,766 |
| Indonesia | 53 | (2) | | | | 212 | (2) | (2) | 2 | | 2 | 8 | 277 |
| Japan | 952 | 147 | 8 | 3,855 | 8,187 | 2,184 | 5 | 6 | 40 | 4,943 | 30 | 24 | 20,381 |
| Malaysia | | (2) | | (2) | | 157 | (2) | (2) | 2 | | 2 | 3 | 164 |
| Philippines | | 9 | (2) | | (2) | 402 | 19 | | 15 | 20 | 12 | 21 | 498 |
| Turkey | | 74 | 1 | | | 505 | 5 | | (2) | | (2) | 36 | 621 |
| Other | 10 | 90 | 1 | (2) | 2 | 1,238 | 57 | 9 | 51 | 46 | 17 | 52 | 1,572 |
| **Total** | 1,015 | 322 | 11 | 3,865 | 8,195 | 6,302 | 90 | 15 | 113 | 5,108 | 88 | 155 | 25,279 |
| **Africa:** | | | | | | | | | | | | | |
| Congo (Leopoldville) | | 6 | 1 | | | 104 | 6 | | 2 | (2) | 1 | 5 | 125 |
| South Africa, Republic of | | 164 | (2) | | 180 | 627 | 86 | 2 | 122 | (2) | 18 | 13 | 1,212 |
| United Arab Republic (Egypt) | | 6 | | | | 286 | | 1 | (2) | | (2) | 8 | 301 |
| Other | | 17 | 10 | 6 | | 302 | 32 | 1 | 32 | 126 | 9 | 33 | 568 |
| **Total** | | 193 | 11 | 6 | 180 | 1,319 | 124 | 4 | 156 | 126 | 28 | 59 | 2,206 |
| **Oceania:** | | | | | | | | | | | | | |
| Australia | | 30 | 9 | 3 | 164 | 657 | 6 | 7 | 50 | 263 | 8 | 5 | 1,202 |
| French Pacific Islands | | 48 | 17 | 235 | 78 | 5 | 13 | 5 | | | (2) | 3 | 404 |
| New Zealand | | 18 | 2 | | | 103 | (2) | 2 | 8 | | 3 | (2) | 136 |
| Other | | | 1 | | 3 | (2) | 11 | 10 | | | | (2) | 25 |
| **Total** | | 96 | 29 | 238 | 245 | 765 | 30 | 24 | 58 | 263 | 11 | 8 | 1,767 |
| **Grand total** | 1,361 | 7,125 | 160 | 6,507 | 19,135 | 17,628 | 614 | 5,365 | 1,736 | 13,618 | 236 | 561 | 74,046 |
| **Shipments from the United States to territories and possessions:** | | | | | | | | | | | | | |
| Puerto Rico | | 3 | (2) | (2) | | 137 | 124 | (3) | (3) | (3) | (3) | 6 | 270 |
| Virgin Islands | | 78 | 6 | 84 | | 7 | 278 | (3) | (3) | (3) | (3) | (3) | 453 |
| Wake | | 739 | (2) | 41 | | (2) | 11 | (3) | (3) | (3) | (3) | (2) | 791 |
| Other | | 40 | 3 | 137 | | 5 | 13 | (3) | (3) | (3) | (3) | (2) | 198 |
| **Total** | | 860 | 9 | 262 | | 149 | 426 | (3) | (3) | (3) | (3) | 6 | 1,712 |
| **Exports from Territories to foreign countries:** | | | | | | | | | | | | | |
| Puerto Rico | | 1 | | 1,382 | 266 | (2) | (2) | 7 | | | 1 | | 1,657 |
| **Total net shipments from the United States** | 1,361 | 7,984 | 169 | 5,387 | 18,869 | 17,777 | 1,040 | 5,358 | 1,736 | 13,618 | 235 | 567 | 74,101 |

[r] Revised figure.
[1] Includes naphtha but excludes benzol: 1963—1,541,316 barrels; 1964—2,078,183 barrels.
[2] Less than ½ unit.
[3] Not separately classified.

Source: Bureau of the Census.

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**TABLE 75.—World production of crude petroleum by countries [1]**

(Thousand barrels)[2]

| Country | 1960 | 1961 | 1962 | 1963 | 1964 p |
|---|---|---|---|---|---|
| North America: | | | | | |
| Canada | 189,534 | 220,861 | 244,139 | 258,435 | 275,364 |
| Cuba e [3] | 108 | 80 | 90 | 72 | 80 |
| Mexico | 99,049 | 106,784 | 111,830 | 114,867 | 115,576 |
| Trinidad | 42,357 | 45,768 | 48,876 | 48,678 | 49,724 |
| United States | 2,574,933 | 2,621,758 | 2,676,189 | 2,752,723 | 2,805,125 |
| Total | 2,905,981 | 2,995,251 | 3,081,124 | 3,174,775 | 3,245,869 |
| South America: | | | | | |
| Argentina | 64,132 | 84,418 | 98,154 | 97,221 | 100,370 |
| Bolivia | 3,574 | 2,989 | 2,917 | 3,285 | 3,195 |
| Brazil | 29,613 | 34,807 | 33,401 | 35,714 | 33,310 |
| Chile | 7,231 | 9,263 | 11,689 | 13,206 | 13,687 |
| Colombia | 55,770 | 53,247 | 51,918 | 60,343 | 62,596 |
| Ecuador | 2,730 | 2,926 | 2,573 | 2,465 | 2,796 |
| Peru | 19,255 | 19,371 | 21,134 | 21,468 | 23,119 |
| Venezuela | 1,041,675 | 1,065,757 | 1,167,916 | 1,185,511 | 1,241,782 |
| Total | 1,223,980 | 1,272,778 | 1,389,702 | 1,419,213 | 1,480,855 |
| Europe: | | | | | |
| Albania | 4,854 | 5,144 | 5,238 | 5,339 | e 5,338 |
| Austria | 16,874 | 16,237 | 16,694 | 18,271 | 18,571 |
| Bulgaria | 1,460 | 1,510 | 1,453 | 1,266 | 1,168 |
| Czechoslovakia | 929 | 1,045 | 1,200 | 1,220 | 1,322 |
| France | 14,233 | 15,578 | 17,071 | 18,117 | 20,487 |
| Germany, West | 40,076 | 44,960 | 48,943 | 53,325 | 55,419 |
| Hungary | 9,283 | 11,117 | 12,521 | 13,398 | 13,742 |
| Italy | 13,613 | 13,432 | 12,303 | 12,155 | 18,184 |
| Netherlands | 13,378 | 14,271 | 14,974 | 15,377 | 15,758 |
| Poland | 1,442 | 1,503 | 1,502 | 1,577 | 2,092 |
| Rumania | 85,712 | 86,321 | 88,420 | 91,171 | 92,383 |
| U.S.S.R. [4] | 1,079,371 | 1,212,300 | 1,359,600 | 1,504,300 | 1,646,400 |
| United Kingdom | 649 | 784 | 820 | 910 | 939 |
| Yugoslavia | 6,671 | 9,479 | 11,299 | 11,930 | 13,322 |
| Total [4] | 1,288,545 | 1,433,681 | 1,592,038 | 1,748,356 | 1,905,125 |
| Asia: | | | | | |
| Bahrain | 16,500 | 16,444 | 16,446 | 16,503 | 18,000 |
| Burma | 4,078 | 4,218 | 4,366 | 4,761 | 4,277 |
| China e | 40,150 | 45,260 | 49,640 | 54,750 | 62,050 |
| India | 3,370 | 3,356 | 8,016 | 12,266 | 16,965 |
| Indonesia | 152,988 | 155,369 | 167,771 | 165,002 | 170,739 |
| Iran | 385,748 | 431,653 | 481,939 | 538,107 | 618,731 |
| Iraq | 353,833 | 365,594 | 366,832 | 422,581 | 459,290 |
| Israel | 932 | 1,133 | 1,126 | 1,091 | 1,435 |
| Japan | 3,678 | 4,590 | 5,316 | 5,485 | 4,590 |
| Kuwait | 594,278 | 600,226 | 669,284 | 705,471 | 774,815 |
| Kuwait—Saudi Arabia neutral zone | 49,829 | 65,153 | 89,224 | 114,535 | 131,415 |
| Mongolia e | 290 | 360 | 360 | 360 | 360 |
| Pakistan | 2,636 | 2,829 | 3,338 | 3,514 | 3,732 |
| Qatar | 63,088 | 64,386 | 67,911 | 70,129 | 77,740 |
| Sarawak and Brunei | 34,005 | 30,551 | 28,286 | 29,639 | 26,265 |
| Saudi Arabia | 456,453 | 508,269 | 555,056 | 594,592 | 628,095 |
| Taiwan (Formosa) | 14 | 17 | 14 | 19 | 61 |
| Trucial States | | | 5,976 | 17,571 | 67,465 |
| Turkey | 2,624 | 3,075 | 4,157 | 5,090 | 5,897 |
| Total [4] | 2,164,494 | 2,302,483 | 2,525,058 | 2,761,466 | 3,071,922 |

See footnotes at end of table.

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**TABLE 75.—World production of crude petroleum by countries [1]—Continued**

(Thousand barrels) [2]

| Country | 1960 | 1961 | 1962 | 1963 | p 1964 |
|---|---|---|---|---|---|
| Africa: | | | | | |
| Algeria [3] | 67,613 | 121,494 | 158,094 | 184,311 | 202,290 |
| Angola | 477 | 757 | 3,404 | 5,776 | 6,535 |
| Congo, Republic of (Brazzaville) | 365 | 724 | 926 | 820 | 619 |
| Gabon, Republic of | 5,626 | 5,446 | 5,992 | 6,446 | 7,668 |
| Libya | | 6,642 | 67,052 | 167,786 | 315,642 |
| Morocco | 695 | 603 | 968 | 1,140 | 910 |
| Nigeria | 6,552 | 16,802 | 24,624 | 27,644 | 43,997 |
| Senegal | 12 | 16 | 3 | | |
| United Arab Republic (Egypt) | 22,785 | 26,136 | 32,321 | 38,759 | 43,915 |
| Total | 104,125 | 178,620 | 293,384 | 432,682 | 621,576 |
| Oceania: | | | | | |
| Australia | | | | | 1,487 |
| New Zealand | 5 | 4 | 4 | 4 | 4 |
| West Irian | 1,538 | 1,082 | 917 | 924 | 753 |
| Total | 1,543 | 1,086 | 921 | 928 | 2,244 |
| World total [4] | 7,688,668 | 8,183,899 | 8,882,227 | 9,537,420 | 10,327,591 |

e Estimate. p Preliminary.
[1] This table incorporates some revisions.
[2] 42-gallon barrels.
[3] Natural naphtha and gas oil.
[4] U.S.S.R. in Asia (including Sakhalin) included with U.S.S.R. in Europe.
[5] Including Sahara.

## NATIVE ASPHALT

**Bituminous Limestone and Sandstone.**—In 1964 the production of bituminous limestone and bituminous sandstone combined was 1,444,000 short tons, a gain of 18.6 percent for the year. The total value of bituminous materials in these two categories produced in the United States in 1964 was valued at $3,513,000 and the average value per ton was $2.43, slightly less than the corresponding value, $2.46, in 1963.

**Gilsonite.**—The production figure for gilsonite cannot be disclosed by the Bureau of Mines because of the limited number of producers. All gilsonite production is in the State of Utah, and most of the gilsonite produced is transported by pipeline to a refinery in southern Colorado for processing.



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# Helium

By Edwin M. Thomasson [1]

HELIUM SHIPMENTS in 1964 exceeded the volume shipped during the previous year for the 15th successive time. Shipments from Bureau of Mines helium plants were 667.4 million cubic feet,[2] about 6 percent more than in 1963. Production at Bureau of Mines plants totaled 784.5 million cubic feet. An additional 3,193.1 million cubic feet, which was produced by private companies participating in the helium conservation program, was purchased by the Bureau and stored underground for future use.

The Bureau of Mines continued to sell helium at $35 a thousand cubic feet, the price established in 1961. Substantial railway freight rate reductions for tank car shipments of helium went into effect during the year, resulting in a lower delivered price for helium.

As the Nation moved ahead in the space age, it became increasingly apparent that helium would continue to play an essential role in research, in technology, in defense, and in industry.

## PRODUCTION

Eleven plants in the United States produced helium during 1964. For convenience, these plants can be segregated into three categories: (1) The plants owned by the U.S. Government and operated by the Bureau of Mines, which produce helium for sale to both Federal agencies and private customers, (2) the "conservation" plants, privately owned and operated, but producing helium solely for purchase by the Bureau of Mines for conservation purposes, and (3) privately owned plants producing helium for independent sale in the commercial market.

The Bureau of Mines operates five federally owned helium extraction plants, located at Amarillo and Exell, Tex.; Keyes, Okla.; Otis, Kans.; and Shiprock, N. Mex. These plants produced a combined total of 784.5 million cubic feet of helium during 1964, an increase of 1.3 percent over 1963 production. All Bureau plants produce only grade A helium; that is, helium with a purity of at least 99.995 percent. Each of the five Bureau plants processed essentially all available natural gas and operated without difficulty throughout the year. Production exceeded demand, and 131 million cubic feet of helium

[1] Staff engineer, Office of Assistant Director, Helium.
[2] All volumes of gases reported in this chapter are measured at 14.7 pounds per square inch absolute and 70° Fahrenheit.



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produced by the Bureau plants was added to underground storage. However, 0.734 million cubic feet of stored helium was withdrawn from underground storage along with native helium-bearing natural gas in maintaining the plant load at the Amarillo plant. Table 1 shows helium production in the United States since 1921, and table 2 shows production of each of the five Bureau of Mines plants.

**TABLE 1.—Helium production in the United States**

(Million cubic feet)

| Year | Production | Year | Production |
|---|---|---|---|
| 1921–28 | [1] 5.8 | 1961 | 727.6 |
| 1929–42 | [1] 11.8 | 1962 | 713.4 |
| 1943–49 | [1] 83.5 | 1963 | 2,231.5 |
| 1950–54 | [1] 138.0 | 1964 | 4,027.4 |
| 1955–59 | [1] 313.4 | | |
| 1960 | 642.0 | Total 1921–64 | 11,395.0 |

[1] Annual average.

**TABLE 2.—Production of helium by Bureau of Mines plants**

(Million cubic feet)

| Plant location | Production | |
|---|---|---|
| | 1963 | 1964 |
| Amarillo, Tex. | 62.7 | 51.3 |
| Exell, Tex. | 286.5 | 307.5 |
| Keyes, Okla. | 300.4 | 298.8 |
| Otis, Kans. | 46.4 | 44.8 |
| Shiprock, N. Mex. | 78.2 | 82.1 |
| Total | 774.2 | 784.5 |

The conservation plants extract crude helium (a mixture of principally helium and nitrogen, containing 50 to 85 percent helium) from natural gas before the natural gas is consumed as fuel. These five plants are owned and operated by private companies, but their entire output of crude helium is purchased by the United States for conservation purposes under long-term contracts. The conservation plants produced and sold to the United States 3,193.1 million cubic feet of helium during 1964, an increase of 125 percent over 1963 production. A more complete discussion of the helium conservation program is presented later in this chapter.

The final category of helium extraction plants comprises privately owned plants producing helium for independent sale in the commercial market. Only one plant falls into this category at present—the plant owned and operated by Kerr-McGee Oil Industries, Inc., near Navajo, Ariz. The Kerr-McGee plant has an annual capacity of about 60 million cubic feet of helium, and production during 1964 was slightly more than three-fourths of plant capacity, or about 46 million cubic feet. The Kerr-McGee plant produces grade A helium extracted from nonflammable gas resources owned or controlled by the company in the Pinta Dome and Navajo Springs fields, Apache County, Ariz. The market for the Kerr-McGee helium is made up of non-Federal customers, principally on the West Coast.

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## SHIPMENTS

Helium shipments from Bureau of Mines plants totaled 667.4 million cubic feet. Federal agencies received 499.4 million cubic feet, and 168.0 million cubic feet was sold to non-Federal customers. In delivering helium to customers, the five Bureau plants together filled and shipped 1,928 railway tank cars, 1,230 highway semitrailers, and 247,539 standard gas cylinders.

Two early model, low capacity, Bureau of Mines railway tank cars were transferred to the U.S. Atomic Energy Commission for use as on-site helium storage containers. Another car was transferred to the National Aeronautics and Space Administration. These transfers reduced the Bureau's active railway tank car fleet to 233. Two highway semitrailers, each with a capacity of 135,000 cubic feet of helium at filling pressure of 2,640 pounds per square inch, were added to the Bureau fleet, bringing the total semitrailer fleet to seven. Many helium customers, both Federal and non-Federal, also own semitrailers used to transport helium from Bureau plants.

The Bureau plant at Amarillo, Tex., is specially equipped to fill, handle, and ship standard gas cylinders (Interstate Commerce Commission 3A and 3AA cylinders), and all cylinder shipments originate there. The four remaining Bureau plants are equipped to fill and ship railway tank cars, and all five plants can handle highway semitrailers. A new diaphragm-type compressor was installed at the Otis, Kans., plant during the year, and now all five Bureau plants can fill shipping containers to maximum pressures of 4,000 pounds per square inch.

## CONSUMPTION AND USE

Sales of helium from Bureau plants in 1964 of 667.4 million cubic feet was an increase of 40.1 million cubic feet, or slightly more than 6 percent, over the previous record of 627.3 million cubic feet set in 1963. Shipments (sales) from Bureau of Mines plants are shown in table 3.

About 46 million cubic feet of privately produced helium was consumed in addition to that supplied by the Bureau of Mines. Consequently, the total volume of helium delivered to consumers and presumably used in 1964 was about 713 million cubic feet, about 7.7 percent above the 1963 consumption of 662 million cubic feet.

No detailed helium utilization survey was undertaken during 1964, but it is believed that the overall use pattern reported in the 1963 "Helium" chapter remained substantially unchanged. Over one-half of all helium consumed was used in connection with the various space and missile programs. Shielded-arc welding and research applications continued to require significant quantities of helium.

Table 4 shows the quantity of helium used annually since 1950.

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TABLE 3.—Shipments of helium from Bureau of Mines helium plants

| Recipient | 1963 | | 1964 | |
|---|---|---|---|---|
| | Million cubic feet | Percent | Million cubic feet | Percent |
| Federal agencies: | | | | |
| Department of Defense | 337.3 | 53.8 | 347.3 | 52.0 |
| Atomic Energy Commission | 75.5 | 12.0 | 64.8 | 9.7 |
| National Aeronautics and Space Administration | 52.6 | 8.4 | 79.7 | 11.9 |
| Weather Bureau | 7.8 | 1.2 | 7.0 | 1.1 |
| Other | .5 | .1 | .6 | .1 |
| Total | 473.7 | 75.5 | 499.4 | 74.8 |
| Non-Federal consumers | 153.6 | 24.5 | 168.0 | 25.2 |
| Total shipments | 627.3 | 100.0 | 667.4 | 100.0 |

TABLE 4.—Helium use in the United States

(Million cubic feet)

| Year | Quantity | Year | Quantity |
|---|---|---|---|
| 1950 | 81 | 1958 | 352 |
| 1951 | 109 | 1959 | 375 |
| 1952 | 145 | 1960 | 475 |
| 1953 | 158 | 1961 | 551 |
| 1954 | 190 | 1962 | [1] 630 |
| 1955 | 236 | 1963 | [1] 662 |
| 1956 | 267 | 1964 | [1] 713 |
| 1957 | 310 | | |

[1] Includes helium produced and sold by the privately owned Kerr-McGee plant at Navajo, Ariz.

## RESOURCES

The Bureau of Mines conducts a continuing survey of helium resources in the United States. The survey is conducted by obtaining and analyzing for helium content samples of natural gas from various natural gas wells and fields throughout the country. During 1964, 466 natural gas samples from 26 States were obtained and analyzed. No significant new deposits of helium-bearing natural gas were discovered, and there were no major additions to the known helium resources of the country.

The helium resources of the United States in helium-bearing natural gas containing at least 0.3 percent helium by volume are estimated to be approximately 194 billion cubic feet as of January 1, 1963, the date of the latest estimate. About 92 percent of these resources are located in five major helium-bearing gasfields: (1) The Hugoton field of Kansas, Oklahoma, and Texas, (2) the Panhandle field of Texas, (3) the Keyes field of Oklahoma, (4) the Greenwood field of Kansas and Colorado, and (5) the Cliffside field of Texas. All of these fields are within about 200 miles of Amarillo, Tex.

Other helium-bearing natural gas deposits occur in the Paradox basin area of western Colorado and eastern Utah, in northwestern New Mexico, in Arizona, in Wyoming, in Montana, and in Michigan. In general, the helium resources in these areas are limited. The natural gas production is also limited, and consequently, the resulting wastage of helium constitutes only a small percentage of the total volume of

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helium wasted annually. Figure 1 shows the general location of known deposits of helium-bearing natural gas.

About 10 percent of the known helium-bearing natural gas resources in the United States is available to the five Bureau of Mines helium plants. The two largest Bureau plants—Exell, Tex., and Keyes, Okla.—extract helium from gas produced from the Panhandle and Keyes fields. The Cliffside field is the only developed source of helium-bearing natural gas owned by the Government and provides the source gas for the Amarillo plant. The plants at Shiprock, N. Mex., and Otis, Kans., extract helium from gas produced from small helium-bearing gasfields.

Two minor helium-bearing natural gas deposits discovered on public domain lands in Utah were established as Helium Reserves Nos. 1 and 2 in March 1924 and June 1933, respectively. The helium resources of the two reserves are very small in relation to the present rate of helium production and use, and engineering reappraisal in light of oil and gas exploration on or near the reserves resulted in major downward revision of the estimated helium therein. As a result, the Secretary of the Interior, by Public Land Order 3427 of August 4, 1964 (29 FR 11455), revoked the Executive orders creating the Helium Reserves, thereby terminating the helium reserve status of the lands involved.

In addition to helium-bearing natural gas, other sources of helium—such as gases from mineral springs, fumaroles, and volcanoes; the air; rocks and minerals; and meteorites—are of general and scientific interest. However, none of these occurrences offers an economically feasible source material from which to extract helium. Under present conditions helium-bearing natural gases remain the only economical sources of helium, and this situation seems likely to continue.

## CONSERVATION

Helium is a completely inert element, and thus its occurrence as a minor constituent in certain natural gases contributes nothing to the fuel value of the natural gases. However, unless this helium is removed before the natural gas is consumed as fuel, the contained helium is forever lost to the atmosphere without serving any useful purpose.

National resources of helium are diminishing rapidly as helium-bearing natural gas is consumed as fuel, and resources of helium appear adequate to meet predicted future needs only if the loss of this vital element is curtailed. This need to conserve a diminishing and irreplaceable natural resource was recognized, and the Congress enacted Public Law 86–777, effective March 1, 1961, which amended the Helium Act of 1925, as amended (43 Stat. 1110; 50 U.S.C. 161, 163–66). The new law included an authorization for the Bureau of Mines to purchase helium for conservation and ultimate resale. Authority to enter into purchase contracts, in an aggregate amount not to exceed $47.5 million a year, was granted in the act (Public Law 87–122) making appropriations for the U.S. Department of the Interior and related agencies for the fiscal year ending June 30, 1962.

Under these authorizations, the Department of the Interior, through the Bureau of Mines, launched a long-term helium conservation program in 1961. The Department entered into four contracts under

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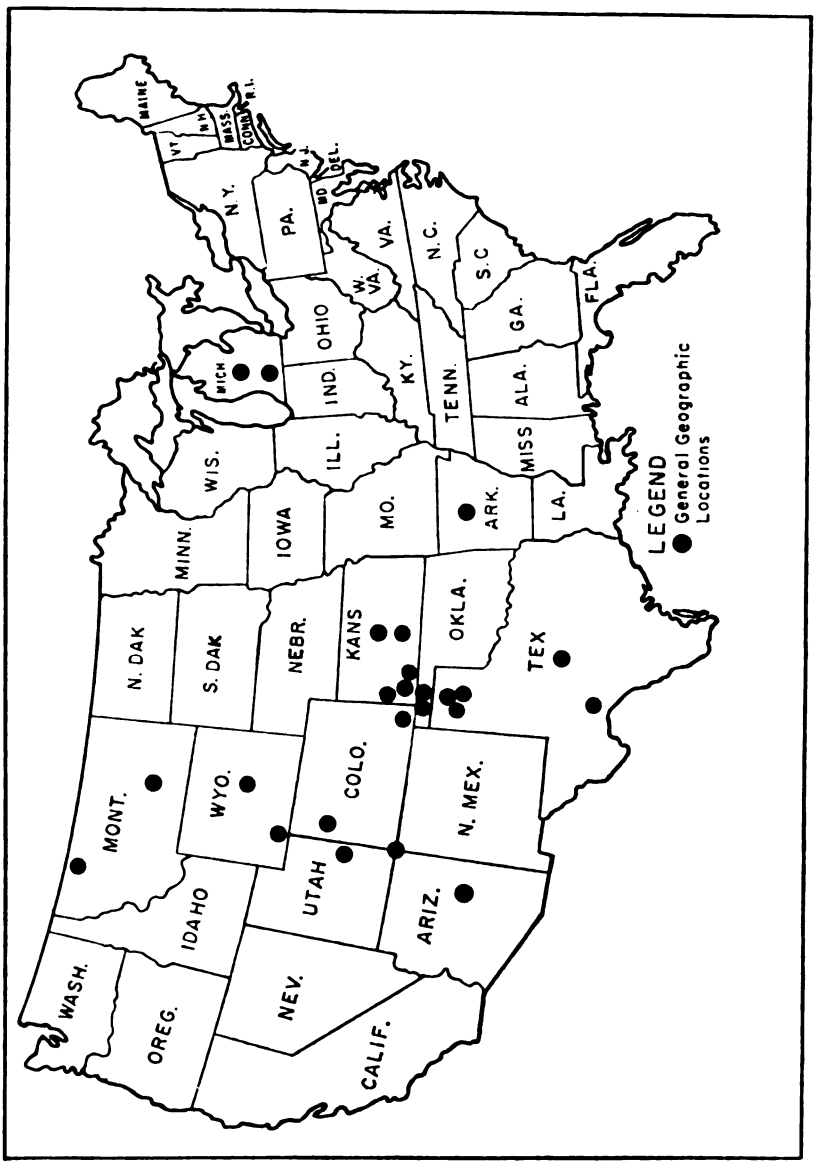


FIGURE 1.—Locations of known helium resources in the United States where the helium content of natural gas is 0.3 percent or more.

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which four private companies agreed to finance, build, and operate five plants to recover helium from natural gas before the natural gas goes to market. Each contract is for 22 years and provides that the Bureau of Mines will purchase, up to specified limits, the entire output of helium from each plant. The four contracts utilize the entire $47.5 million a year contracting authority established by Congress.

Concurrently, the Bureau constructed a 425-mile helium pipeline to connect these plants with the Government's Cliffside gasfield and conditioned the wells in the Cliffside gasfield to facilitate the injection of the helium into a natural gas-bearing formation. The pipeline extends from Bushton, Kans., to the Cliffside field near Amarillo, Tex.

Two of the conservation plants began production in 1962—the Northern Helex Co. plant near Bushton, Kans., and the Phillips Petroleum Co. plant in Hansford County, Tex. The remaining three plants—the Cities Service Helex, Inc., plant at Ulysses, Kans.; the National Helium Corp. plant near Liberal, Kans.; and the Phillips Petroleum Co. plant at Dumas, Tex.—commenced operations during 1963. All five plants operated throughout 1964.

In conception and operation, the helium conservation program is essentially a simple program. Helium-bearing natural gas, on the way to market, is routed through one of the five conservation plants, where the helium and some nitrogen are removed by low-temperature processing. The natural gas is returned to the pipeline for transmission to market. The gaseous helium-nitrogen mixture, ranging from 50 to 85 percent helium, is delivered to the Bureau of Mines pipeline, through which it is transported to the Cliffside field. At the Cliffside field it is injected into a partially depleted gas-bearing formation, to be stored until needed. When future needs demand, the helium-nitrogen mixture will be withdrawn and purified. The pure helium will then be sold to fulfill governmental and industrial requirements.

Table 5 shows the quantities of helium purchased by the Bureau of Mines from each of the conservation plants since the inception of the conservation program.

Whenever production at Bureau plants has exceeded market requirements, the helium produced in excess of demand has been stored in the Cliffside field. Table 6 shows the amounts stored each year and the amount in storage at yearend.

**TABLE 5.—Helium purchased by the Bureau of Mines for conservation**

(Million cubic feet)

| Company and location of plant | Helium delivered | | |
|---|---|---|---|
| | 1962 | 1963 | 1964 |
| Northern Helex Co., Bushton, Kans. | 1.9 | 208.1 | 493.9 |
| Cities Service Helex, Inc., Ulysses, Kans. | ---- | 75.3 | 492.2 |
| National Helium Corp., Liberal, Kans. | ---- | 467.5 | 1,184.4 |
| Phillips Petroleum Co., Dumas, Tex. | ---- | r197.7 | 458.7 |
| Phillips Petroleum Co., Hansford County, Tex. | .5 | r481.7 | 563.9 |
| Total | 2.4 | 1,420.3 | 3,193.1 |

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TABLE 6.—Helium in conservation storage

(Million cubic feet)

| Year | Amount stored during year | | Amount in storage on Dec. 31 |
|---|---|---|---|
| | From Bureau of Mines plants | From conservation plants | |
| 1960 | [1] 273 | ---------- | 273 |
| 1961 | 174 | ---------- | 447 |
| 1962 | 75.2 | 2.4 | 524.6 |
| 1963 | 165.0 | 1,420.3 | 2,109.9 |
| 1964 | 131.0 | 3,193.1 | [2] 5,433.3 |

[1] Stored during 1960 and in previous years.
[2] Total reflects 0.734 million cubic feet withdrawn from storage during 1964.

## PRICES

The revised Helium Act (Public Law 86–777) directs agencies of the Federal Government to purchase all major helium requirements from the Secretary of the Interior. It also provides that helium shall be sold at prices adequate to sustain the program and to cover all costs of carrying out provisions of the act, including repayment to the Treasury of the United States, with interest, the net capital and retained earnings when the act was passed.

Until November 18, 1961, sales were at prices of $15.50 and $19 a thousand cubic feet (f.o.b. plant) for Federal and non-Federal purchasers, respectively. These prices were established in 1954. The price necessary to cover all costs of carrying out the provisions of the Helium Act and to make the prescribed repayments was calculated to be $35 a thousand cubic feet. On November 18, 1961, the $35 price went into effect, applicable to all purchasers. This price has remained without change and is still in effect. Revised regulations, a schedule of charges, and other information on the sale of helium and rental of containers by the Bureau of Mines are included in the Code of Federal Regulations (30 CFR 1).

Substantial freight rate reductions for railway tank car shipments of helium were obtained from rail carriers during 1964. The reductions, averaging 31 percent, will result in an overall savings to the United States of about $650,000 annually. While the selling price of helium f.o.b. plant remained unchanged, the freight reduction materially reduced the delivered unit price of helium in bulk lots to major Federal customers.

## FOREIGN TRADE

Helium is exported under licenses issued by the Office of Munitions Control, U.S. Department of State. Exports amount to less than 0.5 percent of the annual domestic consumption. It is believed that most exported helium is used in fundamental and applied research, in chromatography, and in various atomic energy applications.

In December 1963, a helium plant near Swift Current in Saskatchewan Province, Canada, commenced operation. The plant has an annual production capacity of 12 million cubic feet and produces grade A helium from a small, nonflammable helium-bearing gas de-

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posit. Production for 1964 is not definitely known, but available information indicates that the plant has not reached sustained capacity production. The helium will be marketed principally in Canada and Europe. The Canadian plant is the only helium production facility in the free world outside the United States.

## TECHNOLOGY

Kerr-McGee Oil Industries, Inc., installed a 100-liter-an-hour helium liquefier at its Navajo, Ariz., helium plant. Also installed was a vacuum-jacked, nitrogen-shielded storage facility of 4,500- liter capacity.

A cryogenic filter method to produce superpure gaseous helium for experimental use was reported during the year.[3] The method involves cooling helium to below 2.19° K in a low-pressure environment, so that part of the helium becomes superfluid and then filtering through iron oxide particles. Impurities and normal liquid helium cannot pass through the filter. The method can also be used to separate the isotopes of helium.

It was announced that high-purity helium 3 for use as a vapor pressure standard, to measure temperatures between 0.3° K and 3.2° K, is available from Mound Laboratory, Miamisburg, Ohio. Its availability results from a cooperative effort by Los Alamos Scientific Laboratory, National Bureau of Standards, and Mound Laboratory (operated by Monsanto Research Corp. for the U.S. Atomic Energy Commission).

At yearend construction was underway on a privately owned helium plant at Otis, Kans. The plant, owned by Kansas Refined Helium Co., will extract helium from natural gas produced northwest of Otis. The company plans to install a 500-liter-an-hour helium liquefier at the plant. The Air Reduction Sales Co. announced plans for a large-scale bulk liquid helium distribution system, using liquid helium from the new plant. The distribution system will include highway tank trucks, specially designed containers, and three liquid-to-gas conversion plants. Plans called for the plant, the liquefier, and the liquid distribution system to be operational by mid-1965.

The 40,000-kilowatt helium-cooled nuclear power reactor being built by Philadelphia Electric Co. and 52 other private electrical utility companies near Peach Bottom, Pa., was being tested at yearend prior to the installation of the radioactive fuel core. Initial startup of the plant was expected in the spring of 1965. The plant will use helium to transfer the heat produced in the nuclear reactor to water, thus producing steam to power the turbines and generators.

Work completed at the Bureau of Mines Helium Research Center and the Helium Operations Office at Amarillo, Tex., for which results were published included phase equilibria data for low-helium-content natural gas,[4] the development of an apparatus for detecting helium

[3] Reviewed in National Aeronautics and Space Administration Technical Brief 63-10235, March 1964.

[4] DeVaney, Will E., Lowell Stroud, and W. J. Boone, Jr. Low-Temperature Phase Equilibria of a Natural Gas of Low Hellum Content. BuMines Rept. of Inv. 6499, 1964, 17 pp.

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leaks,[5] the application of the method of least squares to pressure-volume-temperature data on gases,[6] a method of determining trace impurities in grade A helium by use of a chromatograph,[7] and additional information collected in the continuous survey of helium-bearing natural gases.[8]

Work at the Helium Research Center is aimed at learning more about basic properties of helium. Thermodynamic and other data for helium and helium mixtures are being reviewed systematically to identify "best" values and to close gaps in data by experiments as warranted. Current projects include measurement of the absolute viscosity of helium, investigation of metastable energy levels in liquid helium, development of a method for measuring heat capacity of helium and helium mixtures, and measurement of the diffusion coefficients and solubility of helium in liquefied gases.

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[5] Klingman, C. L., and J. C. Meeks. An Apparatus for Detecting Helium Leaks. BuMines Rept. of Inv. 6353, 1964, 17 pp.

[6] Dalton, B. J. Application of the Method of Least Squares to PVT Data on Gases. BuMines Inf. Circ. 8226, 1964, 18 pp.

[7] Purer, Al, and C. A. Seitz. A Chromatographic Method for Determination of Trace Impurities in Grade A Helium. Anal. Chem., v. 36, No. 8, July 1964, pp. 1694–1695.

[8] Miller, Richard D., and Geraldine P. Norrell. Analyses of Natural Gases of the United States, 1962. BuMines Inf. Circ. 8239, 1964, 120 pp.

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# Appendix

# Tables of Measurement

## Volumetric measures

| | U.S. gallons | Imperial gallons | Cubic feet | Barrels | Cubic centimeters | Liters | Cubic meter |
|---|---|---|---|---|---|---|---|
| 1 U.S. gallon [1] | 1 | 0.83268 | 0.133681 | 0.0238095 | 3,675.41 | 3.78533 | 0.0037854 |
| 1 imperial gallon [2] | 1.20094 | 1 | .160544 | .028594 | 4,546.04 | 4.54596 | .004546 |
| 1 cubic foot | 7.4805 | 6.2288 | 1 | .17811 | 28,317.01 | 28.316 | .028317 |
| 1 barrel [3] | 42 | 34.9726 | 5.6146 | 1 | 158,987.55 | 158.984 | .15899 |
| 1 cubic centimeter | .000026417 | .00021996 | .000035314 | .0000062895 | 1 | .00099997 | .000001 |
| 1 liter | .264178 | .219975 | .035316 | .00629 | 1,000.027 | 1 | .001000027 |
| 1 cubic meter | 264.17 | 219.97 | 35.315 | 6.2898 | 1,000,000 | 999.973 | 1 |

[1] U.S. gallon = the volume occupied by 231 cubic inches.
[2] 1 imperial gallon = the volume occupied by 10 pounds of water at 62° F when weighed against brass in air at 30 inches of barometric pressure.
[3] 1 barrel = 42 U.S. gallons.

## Weight measures

| | Pounds | Kilograms | Short or net tons | Metric tons | Long ton |
|---|---|---|---|---|---|
| 1 pound | 1 | 0.453592 | 0.0005 | 0.00045359 | 0.00044643 |
| 1 short or net hundred weight | 100.0 | 45.359 | .05 | .04536 | .04464 |
| 1 gross or long hundred weight | 112.0 | 50.802 | .056 | .05080 | .05 |
| 1 kilogram | 2.20462 | 1 | .0011023 | .0011 | .0009842 |
| 1 short or net ton | 2,000. | 907.185 | 1 | .907185 | .892857 |
| 1 metric ton | 2,204.6 | 1,000 | 1.10231 | 1 | .98421 |
| 1 long ton | 2,240 | 1,016.05 | 1.12 | 1.01605 | 1 |

NOTE: 1 English water ton = the volume occupied by 1 long ton of water at 60° F.



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